# Christ University
# Hosur Road, Bangalore - 29

# Department of MCA

## SYLLABUS FOR
## M.C.A

# Credit System for MCA

| *Subject* | **Semesters- No. of hours (credits)** | | | | | | *Hours* | *Credits* | *Marks* |
|---|---|---|---|---|---|---|---|---|---|
| | *I* | *II* | *III* | *IV* | *V* | *VI* | | | |
| Theory Papers | 24(18) | 24(18) | 20(15) | 20(15) | 20(15) | | 108 | 81 | 2700 |
| Practical Papers | 08(04) | 08(04) | 12(06) | 12(06) | 12(06) | | 52 | 26 | 1300 |
| Industry Project | | | | | | 30(06) | 30 | 06 | 300 |
| Seminar | | 02 | 02 | | | | 04 | | 100 |
| **Total** | **32(22)** | **34(22)** | **34(21)** | **32(21)** | **32(21)** | **30(06)** | **194** | **113** | **4400** |
| **Marks** | **800** | **850** | **850** | **800** | **800** | **300** | | | |
| **Innovative Project** | | **(02)** | | | | | | **02** | |
| **Total Hours and Credits** | | | | | | | **194** | **115** | |

**I semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|
| MCA131 | Discrete Mathematical Structures | 03 + 01 | 03 | 100 |
| MCA132 | Digital Logic | 03 + 01 | 03 | 100 |
| MCA133 | Probability and Statistics | 03 + 01 | 03 | 100 |
| MCA134 | Advanced C Programming | 03 + 01 | 03 | 100 |
| MCA135 | Human Resource Management | 03 + 01 | 03 | 100 |
| MCA136 | Programming In COBOL | 03 + 01 | 03 | 100 |
| MCA151 | C Programming Lab | 04 | 02 | 100 |
| MCA152 | COBOL Programming Lab | 04 | 02 | 100 |
| **Total** | | **26+6*** | **22** | **800** |

**II semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|
| MCA231 | Accounting and Financial Management | 03 + 01 | 03 | 100 |
| MCA232 | Relational Database Management System | 03 + 01 | 03 | 100 |
| MCA233 | Software Engineering | 03 + 01 | 03 | 100 |
| MCA234 | Operating Systems | 03 + 01 | 03 | 100 |
| MCA235 | Data Structures | 03 + 01 | 03 | 100 |
| MCA236 | Microprocessors and interfacing techniques | 03 + 01 | 03 | 100 |
| MCA251 | Data Structures Lab | 04 | 02 | 100 |
| MCA252 | Assembly Language Programming Lab | 04 | 02 | 100 |
| MCA271 | Seminar-1 (only CIA) | 02 | | 50 |
| **Total** | | **28+6*** | **22** | **850** |

**III semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|
| MCA331 | Object Oriented Programming using C++ | 03 + 01 | 03 | 100 |
| MCA332 | Computer Architecture | 03 + 01 | 03 | 100 |
| MCA333 | System Software | 03 + 01 | 03 | 100 |
| MCA334 | Unix Programming | 03 + 01 | 03 | 100 |
| MCA351 | C++ Lab | 04 | 02 | 100 |
| MCA352 | Unix Lab | 04 | 02 | 100 |
| MCA353 | DBMS Lab (Project) | 04 | 02 | 100 |
| | Electives (Choose any one) | 03 + 01 | 03 | 100 |
| MCA341A | Server Side Programming | | | |
| MCA341B | Parallel Computing | | | |
| MCA341C | Data Base Administration | | | |
| MCA341D | Embedded Systems | | | |
| MCA371 | Seminar-2 (only CIA) | 02 | | 50 |
| **Total** | | **27+5*** | **21** | **850** |

**IV semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|
| MCA431 | Computer Networks | 03 + 01 | 03 | 100 |
| MCA432 | Computer Graphics with OpenGL | 03 + 01 | 03 | 100 |
| MCA433 | Design and analysis of algorithms | 03 + 01 | 03 | 100 |
| MCA434 | Java Programming | 03 + 01 | 03 | 100 |
| MCA451 | Java Programming Lab | 04 | 02 | 100 |
| MCA452 | Computer Architecture Lab (Project) | 04 | 02 | 100 |
| MCA453 | System Software Lab (Project) | 04 | 02 | 100 |
| | Electives (Choose any one) | 03 + 01 | 03 | 100 |
| MCA441A | .NET Technologies | | | |
| MCA441B | Digital Image Processing | | | |
| MCA441C | Linux Administration | | | |
| MCA441D | Embedded Programming and Real Time Operating Systems | | | |
| MCA481 | Innovative Project | | 02 | |
| **Total** | | **27+5*** | **23** | **800** |

**V semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| MCA531 | TCP/IP and Internet Technology | 03 + 01 | 03 | 100 |
| MCA532 | Software Project Management | 03 + 01 | 03 | 100 |
| MCA533 | Artificial Intelligence and Expert Systems | 03 + 01 | 03 | 100 |
| MCA534 | Distributed Computing Systems | 03 + 01 | 03 | 100 |
| MCA535 | Data Mining & Data warehousing | 03 + 01 | 03 | 100 |
| MCA551 | Computer Networks Lab (Project) | 04 | 02 | 100 |
| MCA552 | Computer Graphics Lab (Project) | 04 | 02 | 100 |
| | Electives (Choose any one) | 04 | 02 | 100 |
| MCA553A | Project on .Net | | | |
| MCA553B | Project on Digital Image Processing | | | |
| MCA553C | Project in Linux platform implementing DBA services | | | |
| MCA553D | Project on Embedded Systems | | | |
| **Total** | | **27+5*** | **21** | **800** |

**VI semester**

| Paper Code | Paper | Hours per Week | Credits | Marks |
|---|---|---|---|---|
| MCA651 | Project | 30 | **6** | **300** |

- Total Marks : 4400
- Total Credits : 115 (including the optional Innovative project 2 credits)

*** Tutorial**

## Certificate courses

| Paper Code | Paper | Hours per course |
|---|---|---|
| MCA201 | MICROCONTROLLER | 60 |
| MCA301 | ORACLE | 60 |
| MCA501 | J2EE | 60 |

## MCA131 Discrete Mathematical Structures

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.** **(8)**

LOGIC : Statements; Logical Connectives, Implications, Tautology and Contradiction; Equivalence Formulas; Predicates, Quantifiers, Negations.
Mathematical Induction and related examples.

**Unit II.** **(10)**

Definition and types of relations. Representing relations using matrices and digraphs. Equivalence relations, Partial Orderings, Hasse diagrams, Lattices as partially ordered sets, Basic properties of Lattices, Boolean Algebra – Definition and examples.

**Unit III.** **(12)**

Introduction to Group Theory, Abelian Groups, Properties of Groups, Subgroups, Condition for a subset to be a subgroup, Order of an element, Cyclic Groups, Cosets and Lagrange's Theorem and its applications

**Unit IV.** **(18)**

Introduction to graph theory, types of graphs, Basic terminology, Subgraphs, Graph isomorphism. Connectedness in simple graphs. Paths and cycles in graphs and digraphs. Euler and Hamiltonian Paths. Necessary and sufficient conditions for Euler circuits and paths in simple, undirected graphs.
Hamiltonicity: Ore's Theorem (page 586), noting the complexity of hamiltonicity, Traveling Salesman's Problem, Nearest neighbor method of finding the minimum weighted Hamiltonian cycle.

**Unit V.** **(12)**

Distance in graphs : Finding Eccentricity, Radius, Diameter, Center, Periphery.
Planarity in graphs, Euler's Polyhedron formula. Kuratowski's theorem (statement only).
Weighted graphs, Dijkstra's algorithm to find shortest distance path in a graph
Trees, Rooted trees, Binary trees, Spanning trees, Minimum spanning trees. Kruskal's and Prim's Algorithm to find minimum spanning trees.

**Text Books:**

1. I.N.Herstein, *Topics in Algebra*, John Wiley & Sons, 2nd edition, 1976.
2. Rosen, Kenneth H, *Discrete Mathematics and Its Applications*, WCB/McGraw-Hill, 5th Edition, 1999.
3. C. L. Liu, *Elements of Discrete Mathematics***,** Tata McGraw-Hill, 2nd edition, 2000.

**Reference Books:**

1. F. Harary, *Graph Theory*, Addison Wesley, 1969.
2. J.P. Tremblay and R.P.Manohar, *Discrete Mathematical Structures with applications to Computer Science*, McGraw-Hill, 1975.
3. D.B.West, *Introduction to Graph Theory*, Pearson Education Asia, 2nd edition, 2002.

**Question paper pattern**

**Part–A**: Ten (10) questions to be answered out of 12, each carrying three (3) marks. **Marks: 3 x 10 = 30**

Questions:
- Two(2) from Unit – I
- Two(2) from Unit – II
- Four(4) from Unit – III
- Two(2) from Unit – IV
- Two(2) from Unit – V

**Part–B:** Two(2) questions to be answered out of Three(3), Each carrying five (5) marks. **Marks: 2 x 5 = 10**

Questions to be asked from Unit-I

**Part–C:** Two(2) question to be answered out of three(3), Each carrying five(5) marks. **Marks: 2 x 5 = 10**

Questions to be asked from Unit-II

**Part–D:** Four (4) questions to be answered out of six(6), Each carrying five(5) marks. **Marks: 4 x 5 = 20**

Questions to be asked from Unit-III

**Part–E:** Five (5) questions to be answered out of seven (7), Each carrying five (6) marks. **Marks: 5 x 6 = 30**

Four(4) Questions to be asked from Unit-IV
Three(3) questions to be asked from Unit-V

**Total Marks = 100**

# MCA132 Digital Logic

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Digital Computer and Information (14)**

Digital Computers, Number Systems – 1's Complement and 2's Complements, Arithmetic Operations, Decimal Codes, Alphanumeric Codes.

**Combinational Logic Circuits**

Binary Logic and Gates, Boolean algebra, Standard forms, Map Simplification, Map Manipulation, NAND and NOR Gates, Integrated Circuits.

**Unit II.**

**Combinational Logic Design (12)**

Combinational Circuits, Design Topics, Analysis Procedure, Design Procedure, Decoders, Encoders, Multiplexers, Binary adders, Binary Subtraction, Binary adder – subtractors, Binary Multipliers, Decimal Arithmetic.

**Unit III.**

**Sequential Circuits (11)**

Sequential Circuit Definitions, Latches, Flip-Flops- SR, D, JK, Edge Triggered, T Flip-Flop, Master-Slave, Designing with D Flip-Flops and JK Flip-Flops with Timing Diagram.

**Unit IV.**

**Registers and Counters (11)**

Definition of Register and Counter, Registers, Shift Registers – Serial Transfer, Serial Addition, Shift register with Parallel Load and Bidirectional Shift Register, Synchronous Ripple Counter, Asynchronous, Synchronous Binary Counters, BCD counter.

**Unit V.**

**Instruction Set Architecture (12)**

Computer Architecture Concepts, Operand Addressing, Addressing Modes, Instruction set Architectures, Data manipulation Instructions, Floating point Computation, Program Control Instruction, Program interrupts.

**Text Books:**

1. Mano, Morris M and Kime Charles R. *Logic and Computer Design Fundamentals,* Pearson Education, 2nd Edition, 2002.
2. Tokheim, *Digital Electronics Principles and Applications*, Tata Mc Graw-Hill, 6th Edition, 2004.

**Reference Books:**

1. Malvino, Paul Albert and Leach, Donald P. *Digital Principles and Applications,* Tata Mc Graw-Hill, 4th Edition, 2000.
2. Bartee, Thomas C. *Digital Computer Fundamentals*, Tata Mc Graw-Hill, 6th Edition, 1995.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA133 Probability and Statistics

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.** **(12)**

Importance of Statistics. Classification and tabulation of data. Presentation of numerical and categorical data. Measures of central tendency – mean, median, mode and partition values-quartiles and percentiles for grouped and ungrouped data.

**Unit II.** **(12)**

Measures of dispersion – range, quartile deviation, standard deviation and coefficient of variation for grouped and ungrouped data. Skewness – Karl Pearson and Bowley's measure of skewness. Correlation – Karl Pearson and Spearman's correlation coefficient. Regression – Simple linear regression.

**Unit III.** **(12)**

Random experiment, sample space and events. Definitions of probability. Addition and multiplication rules of probability. Conditional probability and Bayes theorem. Random variables – Discrete and continuous. (univariate data) Probability mass functions and probability density functions. Expectation and variance.

**Unit IV.** **(12)**

Discrete distributions – binomial, Poisson, hypergeometric – probability problems, mean, variance (without derivations) Continuous distributions – uniform, normal exponential – probability problems, mean and variance (without derivations). Approximation of binomial to Poisson distribution. Approximation of binomial and Poisson to normal distribution.

**Unit V.** **(12)**

Concept of sampling distribution, parameter and statistic – definitions. Interval estimation – single mean and difference between two means (known variances), single proportion and difference between two proportions, sample size determination. Testing of hypothesis – null and alternative hypothesis, level of significance, Type I and Type II errors. Test for single mean and difference between means (known variances), Test for single proportion and difference between two proportions.

**Text Book:**

1. Douglas C Montgomery, George C Runger, *Applied Statistics and Probability for Engineers*, Wiley student edition, 2004.

## Question paper pattern

### Part A

Consists 12 questions of 2 marks each, of which 10 have to be answered. The questions should cover the entire syllabus.
Definitions, statements, small problems with short answers to be asked in this section.

### Part B

One question each from Unit I, Unit 2 and Unit 3. Each question carries 20 marks and can have a maximum of 4 sub questions. The student has to answer any two main questions.

### Part C

One question each from unit 4, and Two question from unit 5. Each question carries 20 marks and can have a maximum of 4 sub questions. The student has to answer any two main questions

# MCA134 Advanced C Programming

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Fundamentals of Programming** **(12)**

Introduction to logic, algorithm, flowchart, programs – Compiler, Interpreter, Debugger, Profiler, Object Code, Source Code, Preprocessor

**Introduction to C Language**

History – Language Features – Language rules – Data Types – Typecasting.
Operators – Arithmetic, Relational, Logical, Ternary, Shift Operators
Loop Constructs – Looping and Branching – For, While, Do… While, if. …else, Switch and others.

**Unit II.**

**Functions** **(12)**

User-defined functions – Void functions, Value-returning functions – Function prototypes – Call-By-Value
Specialty of main ( ) function – The default arguments in main ( ) functions – argc and argv
Variable-arguments length Functions – Header files.

**Storage Types**

Introduction to Storage Types – Static, Auto, Register, Extern – Specialty of Static and Global variables (File Level Variables)

**Unit III.**

**Storage-Structures** **(13)**

Introduction to Arrays (Char, Int, Float, Double, Struct) – Limitations of Arrays – Passing arrays to functions

**Pointers**

Definition – Introduction to different pointers – Char, Int, Float and Double – Call-By-Reference – Functions returning pointers and accepting pointers as arguments.
Introduction to pointers to Functions – Introduction to Dynamic memory allocation – Library functions under alloc.h (malloc, realloc, calloc, free)

**Unit IV.**

**Macro Processor** **(11)**

Specialty of macro processing – Declaration, Conditional, Include directives

**User-Defined Data types(UDD)**

Introduction to Structures, Unions, Enumerations – Structure padding, byte-alignment – Use of pointers to Structures and Unions – Introduction to More Operators
[ *(dereference), -> and ->* operators ]

**Unit V.**

**External Storage (12)**

Concept of Files – Reading/Writing to Files – Different modes of reading/writing to files – Library functions under fcntl.h [ fopen, fwrite, fread, open, read, write, fseek, lseek, ...]

**LowLevel Language Support**

Introduction to Bit-Fields – Using Shift Operators ( >> and <<) – Introduction to XOR operator ("^"), Bitwise Operator ("&"), Bitwise Operator ("|") and Complement Operator ("~")

**Text Books:**

1. Deitel & Deitel, *C – How to Program*, Pearson Education Asia, 3rd edition, 2001

**Reference Books:**

1. Gottfried Byron, *Programming with C,* Tata McGraw Hill, 1995.
2. Kanetkar Yeshwant, *Understanding Pointers in C*, BPB publications, 3rd edition, 2002.
3. Kanetkar Yeshwant, *Writing TSRs through C*, BPB publications, 1st edition, 2002.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA135 Human Resource Management

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Human Resource Management (13)**

Concept, Objectives, Scope, Functions and Models of HRM. Corporate Strategies and HRM.

**Human Resource Management in Changing Environment**

Human Resource Management in India, Paradigm Shifts in People Management, Problems and Challenges of Human Resource Management in India.

**Human Resource Development**

Meaning, Objectives and Scope of Human Resource Development in India. Methods for Training workers and managers, Problems and Challenges of training and Development in India, Evaluation of Training Effectiveness.

**Unit II.**

**Human Resource Planning (11)**

Definition, Objectives, Scope and Importance, Methods of Forecasting, Human Resource Information Systems.

**Recruitment, Selection, Socialization**

Meaning and Objectives, Sources and Constraints of Recruitment, Selection Process, Methods of Selection, Reliability and Validity of Test.

**Unit III.**

**Performance Management and Appraisal (11)**

Meaning, Objectives, Scope and Purpose, Appraisal Process, Methods for Evaluating Performance, Problems and Challenges in Appraisal, Feedback and Coaching, Career Planning and Succession Planning.

**Wage and Salary Administration**

Definition and Objectives, Theory of Wages, Methods for Computing Value and Worth of Jobs, Components of worker compensation, Components of executive compensation. Problems and Challenges in promoting equity in compensation and reward systems.

**Unit IV.**

**Labour Management Relations (12)**

Definition, Objectives, Theories of Industrial relations, Features of Industrial Relations in India, Methods of Managing Employment Relationship.

**Trade Unions**

Definition, Objectives and Purpose of Trade Unions, Trade Union Movement in India, Trade Union At 1926, Issues, Problems and Challenges of Trade Union in India.

**Unit V.**

**Collective Bargaining** **(13)**

Definition, Objectives and Scope of Collective Bargaining, Process of Collective Bargaining, Types of Collective Bargaining, Collective Bargaining in India, Productivity Bargaining.

**Workers Participation in Management**

Definition, Objectives and Scope of Workers Participation in Management, Levels of Participation, Workers Participation in India.

**Employee Grievances and Discipline**

Definition, Objectives and Scope, Grievance Procedure, Positive and Negative Discipline. Latest Issues, Problems and Challenges in the Employer- Employee Relationship.

**Text Books:**

1. William B. Werther & Keith Davis, *Human Resource and Personnel Management*, McGraw Hill, 5th Edition, 1995
2. Terry L. Leap and Michael D. Crino, *Personnel / Human Resource Management*, Maxwel Macmillan.

**Reference Books:**

1. H. John Barnardian & Jyoce E.A. Russel, *Human Resource Management and Experimental Approach*, McGraw Hill, 2004
2. David A. Decezo & Stephen P. Robbins, *Personnel/ Human Resource Management*, Prentice Hall India, 2003
3. Aswathappa, *Human Resource Management*, Tata McGraw Hill, 3rd Edition, 2002

## Question Paper Pattern

Question paper has to be set for total marks of 100.

| | |
|---|---|
| **Part–A**: Five questions to be answered out of seven | 2 x 5 = 10 |
| **Part–B:** Five questions to be answered out of six | 5 x 5 = 25 |
| **Part–C:** Three questions to be answered out of four | 15 x 3 = 45 |
| **Part–D:** Case study, (compulsory) | 20 x 1 = 20 |

**Total Marks = 100**

# MCA136 Programming In COBOL

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to structured program design in COBOL (13)**

History of COBOL, Features of COBOL, Coding Format for COBOL programs, Basic structure of a COBOL program, IDENTIFICATION DIVISION, ENVIRONMENT DIVISION, The sections of the Environment Division, DATA DIVISION, Forming data names, File Section, Working-Storage section, Level numbers, PICTURE and VALUE clauses, PROCEDURE DIVISION. Moving data, Numeric Move, Non numeric move, Printing information and displaying output interactively, Editing characters.

**Unit II.**

**Computing in COBOL (13)**

The arithmetic verbs: ADD, SUBTRACT, MULTIPLY, DIVIDE and COMPUTE, IF statement, GO TO, GO TO with DEPENDING option, Simple PERFORM, PERFORM...TIMES, PERFORM… UNTIL, PERFORM…VARYING and PERFORM…VARYING…AFTER, USAGE, SYNCHRONIZED, JUSTIFIED, REDEFINES, RENAMES and SIGN clauses, Qualification of Data Names.

**Unit III.**

**Table handling (12)**

OCCURS clause and subscripting, Multidimensional tables, Indexed tables and Indexing, SET verb, SEARCH verb, Linear search and Binary search, OCCURS DEPENDING clause. Subroutines – Structure of a COBOL subroutine, The calling of a subroutine, CANCEL statement.

**Unit IV.**

**File System (11)**

File characteristics, Sequential Files, File Control and File Description entries, Statements for sequential files, Sorting, SORT using INPUT/OUTPUT PROCEDURE, Merging, MERGE using OUTPUT PROCEDURE.

**Unit V.**

**Direct Access Files (11)**

Indexed Sequential Files and Relative Files, File-control entries and Procedure Division statements for Indexed Sequential Files and Relative Files, Updating of files.

**Text Books:**

1. Stern & Stern, *Structured COBOL Programming*, John Wiley publications, 8th Edition, 1996
2. Roy M K & Dastidar, *Structured COBOL Programming*, Tata McGraw Hill, 2nd Edition, 2001

**Reference Books:**

1 1. Philippakis & Kazmier, *Comprehensive COBOL*, Mitchell McGRAW-HILL, 4th Edition, 1991
2. Shelly Cashman Foreman, *Structured COBOL Programming*, Shelly Cashman Series, 2nd Edition, 2000

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA151 C Programming Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

**Section A**

1. Implementation of the various Data Types in C.
2. Demonstration of Data type conversion (Hint: Usage of type casting).
3. Implementation of various Storage Types.
4. Demonstration of for loop.
5. Demonstration of do...while loop.
6. Demonstration of while loop.
7. Demonstration of nested if (Hint: Use logical operators).
8. Demonstration of switch... case structure.
9. Implementation of arrays ( Hint: character arrays )
10. Implementation of multidimensional arrays (Hint: implement matrix operation).
11. Implementation of functions (Hint: Demonstrate call by value, call by schemes, passing of arrays).
12. Demonstration of various string operations (Hint: Usage of user defined functions only allowed).
13. Demonstration of pointer operations.
14. Demonstration of macro processing.
15. Demonstration of recursion (Hint: GCD, factorial, Fibonacci series).

**Section B**

16. Implementation of structures (Hint: simple structure operations, array of structures).
17. Implementation of Union.
18. Implementation of pointers to structures and unions.
19. Demonstration of dynamic allocation of memory (Hint: malloc, calloc, realloc, free).
20. Demonstration of sorting techniques (Hint: selection sort, bubble sort).
21. Demonstration of searching techniques (Hint: linear search, binary search).
22. Demonstration of bitwise operations.
23. Demonstration of various file operations.

**QUESTION PAPER PATTERN**

Two questions will be selected by the examiners (one from section A and one from section B). Students have to write and execute both the programs.

# MCA152 COBOL Programming Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

## Section A

1. To Demonstrate Data Movement Verbs & Arithmetic Verbs.
2. To Implement Conditional Verbs & Sequence Control Verbs
3. To Demonstrate Table Handling.
4. To Implement Subroutines.

## Section B

5. Implementation of files
    a. Sequential Files
    b. Sorting & Merging of Files
    c. Indexed Files
    d. Relative Files
    e. Updating of Files

## QUESTION PAPER PATTERN

Two questions will be selected by the examiners (one from section A and one from section B). Students have to write and execute both the programs.

# MCA231 Accounting and Financial Management

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Accounting** **(12)**

Principles, Concepts and Conventions

**Double Entry System of accounting**

Journal, Ledger, Cash Book, Closing of Books of Accounts and Preparation of Trial Balance.

**Unit II.**

**Final Accounts** **(11)**

Trading, Profit and loss Accounts and Balance Sheet of sole proprietary concern with normal closing and adjusting entries. Final accounts of Joint Stock Companies.

**Financial Management**

Meaning Role and Goals of Financial Management.

**Unit III.**

**Fund Flow Statement** **(13)**

Meaning of the terms – Fund, flow of fund and working capital cycle. Preparation of Fund Flow Statement.

**Ratio Analysis**

Meaning advantages and Limitations. Types of ratios and their usefulness. Calculation of various ratios and their interpretations.

**Unit IV.**

**Costing** **(12)**

Meaning, Nature and importance. Preparation of Cost Sheet, Tender Price Statement.

**Marginal Costing**

Meaning, Nature, scope and importance. Break-Even Analysis. Application of Marginal Costing in Decision-Making.

**Unit V.**

**Budget & Budgetary Control** **(12)**

Budget and Budgetary Control - Meaning and Importance. Different types of Budgets. Preparation of Flexible Budget and Cash Budget.

**Introduction to Computerized Accounting System**

Coding Logic and Codes Required, Master File, Transaction Files, Introduction to Documents used for Data Collection, Processing of different files and outputs obtained, Application Packages in Accounting Tally.

**Text Books:**

1. Kellock. J, *Elements of accounting*, Heinemann, 1978.
2. Rockely LE, *Finance for the non accountant*, Basic Books, 2nd Edition, 1976.

**Reference Books:**

1. Lavy and Sarnat, *Principles of Financial Managament*, Prentice Hall.
2. Arnolel, *Financial accounting*, PHI (Paper Back Edition).

**Question Paper Pattern**

Section A

Answer any Ten questions out of twelve. Each question carries two marks. 10 x 2 = 20

Section B

Answer any four questions out of six. Each question carries ten marks. 4 x 10 = 40

Section C

Answer any two questions out of four. Each question carries 20 marks. 2 x 20 = 40

# MCA232 Relational Database Management System

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction (11)**

Data, Information, Database Management System, Characteristics, Cost and Risks of DBMS Approach, Database Users, DBMS Architecture - Schema, Three level schema, and data models, Conceptual, Logical and Physical data models, logical and physical data independence.

**Storage Structure and File Organization**

Primary and secondary storage devices, sequential, indexed sequential, random file access, hashing techniques.

**Unit II.**

**E-R Data Model (12)**

Entities, attributes and relationships. Different types of attributes, E- R Diagrams.

**Relational Data Model**

Relation, Integrity constraints - domain, entity and referential integrity constraints, Relational algebra, select, project and join operations.

**Unit III.**

**Database Design (12)**

Normalization concepts, first, second, third normal forms, Boyce- Codd normal form & Other advanced Normal Forms.

**SQL**

Data definition, data manipulation, sub queries, correlated sub query, transaction control, Concept of a view, Advantages and updation

**Unit IV.**

**Overview of Hierarchical Model (13)**

Basic Concepts of Hierarchical data model, Tree Structure Diagrams, Single Relationships, Several relationships.

**Network Model**

Basic concepts of network data model, data structure diagrams, binary relationships, general relation ships.

**Database Administration**

Functions of Data & Database Administration, Tools, Concurrency Control, Managing Data Security, Backup & Recovery.

**Unit V.**

**Distributed Databases (12)**

Introduction to Distributed database concepts, Design of Distributed Databases- Replication, Fragmentation, Types of Distributed Database Systems, Commit Protocols- Two Phase Commit Protocol, Three-Phase Commit Protocol, Advantages and disadvantages of Data distribution.

**Object Oriented Database Development**
Introduction, Object Oriented Modeling-representing classes and objects, Class-Diagrams, Types of Operations – constructor, query, update, ODB Architecture, Defining – class, attribute, user structures, operations, range for an attribute, relationships, Defining an abstract class, Creating object instances, Object Query Language, Limitations of OODBMS Objects Vs Relations, Overview of Object Relational Databases.

**Text Books:**

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Addison-Wesley, 2nd Edition, 2004
2. McFadden R. Fred, Hoffer A Jeffrey and Prescott B Mary, *Modern Database Management System,* Addison-Wesley, 5th Edition, 1999

**Reference Books:**

1. Korth F. Henry and Silberschatz Abraham, *Database System Concepts*, McGraw Hill, 2nd Edition, 1991
2. O'neil Patric, O'neil Elizabeth , *Database Principles, Programming and Performance*, Argon Kaufmann Publishers, 2nd Edition, 2002
3. Cooper Richard, *Object Databases an ODMG Approach*, Thomson Computer Press, 1997

**Question Paper Pattern**

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA233 Software Engineering

***Total teaching Hours/Semester:60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**The Product and the Process** **(12)**

The evolving role of software, Software characteristics, software components, software applications, software myths, Software Engineering – A Layered technology, The Software process, Software process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Software process Models, Fourth Generation Techniques.

**Unit II.**

**Software Project Management, Metrics and Planning** **(12)**

The Management Spectrum, People, The Problem, The Process, The Project, Measures, metrics and indicators, Size oriented and Function-oriented metrics for software measurement, metrics for software quality, Resources for Software project planning, Software project Estimation, LOC based Estimation, COCOMO model.

**Risk Management**

Risk Identification, Risk Projection, Risk monitoring and management.

**Unit III.**

**Software Quality assurance** **(12)**

Quality concepts, SQA activities, Formal Technical reviews, Software reliability.

**Software Configuration Management**

Software configuration baselines and items, The SCM process.

**Analysis concepts and principles**

Analysis principles, Software Prototyping, The Software Requirements specification.

**Unit IV.**

**Analysis Modeling** **(12)**

Data modeling, Data flow diagrams, The Mechanics of Structured analysis.

**Design concepts and principles**

The Design process, Design principles, Design concepts, Effective modular design.

**Design Methods** Data design, Architectural design, Interface design, Procedural design.

**Unit V.**

**Software testing** **(12)**

Software testing Fundamentals, White Box Testing, Black Box Testing, A Strategic approach to Software testing, Strategic Issues, Unit testing, Integration testing, Validation testing, System testing.

**Object Oriented Software Engineering**

Identifying elements of an object model, management of object oriented software projects, Conventional vs OO approaches for analysis and design, OOA Process-Use Cases, Design issues, Object oriented testing strategies.

**Text Book:**

1. Pressman S Roger, *Software Engineering*, Mc Graw Hill International Editions, 4th edition, 1997

**Reference Books:**

1. Sommerville, Ian, *Software Engineering*, Addison Wesley, 5th Edition, 2000
2. Rumbaugh, James, *Object Oriented Modeling and design*, Pearson Education, New Delhi, 2005

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA234 Operating Systems

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to Operating Systems** **(12)**

What an Operating System (OS) is, History of OS- Simple Batch Systems, Multi programmed Batch Systems, Time-Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems and Real-Time Systems, An Introduction to Computer System Structures- Computer System Operation, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection, and General System Architecture.

**Operating System Structures**

System Components- Process Management, Main-Memory Management, File Management, I/O System Management, Secondary-Storage Management, Networking, Protection System and Command Interpreter System, Operating System Services, System Calls, Virtual Machines.

**Unit II.**

**Process Management** **(12)**

Process Concept, Process Control Block, Process Scheduling, Operations on Processes, Cooperating Processes, Threads, Inter-process Communication.

**CPU Scheduling**

Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multi-Processor Scheduling and Real-Time Scheduling. Algorithm Evaluation.

**Unit III.**

**Process Synchronization** **(13)**

The Critical Section Problem, Synchronization Hardware, Semaphores, Deadlocks and Starvation, Classical Problems of Synchronization, Critical Regions, Monitors, Atomic transactions, Deadlocks- System Model, Deadlock Characterization, and Methods for Handling Deadlocks- Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovering from Deadlocks.

**Storage Management**

Basic Concepts, Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation

**Unit IV.**

**Virtual Memory** **(12)**

Concept – Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing and Demand Segmentation

**File System Interface and Implementation**

File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics, File System Structure, Allocation Methods, Free-Space Management, Directory Implementation

**Unit V.**

**I/O Systems** **(11)**

Overview of I/O Systems, Secondary Storage Structure- Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management and Disk Reliability. Tertiary-Storage Structure.

**Text Book:**

1. Silberschatz, Abraham and Galvin, Peter Baer. *Operating System Concepts,* John Wiley and Sons, 5th Edition, 2001

**Reference Books:**

1. Stallings, William. *Operating Systems*, Eastern Economy Edition, 2nd Edition, 2002.
2. Tanenbaum, Andrew S. *Modern Operating Systems*, Prentice Hall India, 1999

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA235 Data Structures

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction and overview** **(11)**

Introduction, Basic Terminology, Data Structures, Operations, Algorithms: Time & Space Complexity.

**Preliminaries**

Algorithmic Notation, Control Structures, Complexity of Algorithms, Subalgorithms, Variables, Data Types.

**Arrays**

Introduction, Linear Arrays and Memory Representation, Traversing Linear Arrays, Inserting and Deleting, Sorting, Searching : Linear and Binary Search , Multidimensional arrays, Pointer Arrays, Matrices, Sparse Matrices.

**Unit II.**

**Linked Lists** **(11)**

Introduction, Linked lists and Memory Representation, Traversing, Searching, Memory Allocation, Garbage Collection, Insertion, Deletion, Header Linked lists(Circular), Two-way Lists(Doubly).

**Unit III.**

**Sorting and Searching** **(13)**

Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Radix Sort, Searching and Data Modification, Hashing.

**Stacks and Queues**

Introduction, Stacks, Array Representation, Arithmetic Expressions, Polish Notation, Quick sort – Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive procedures by Stacks, Queues, Dequeues, Priority Queues.

**Unit IV.**

**Trees** **(12)**

Introduction, Binary Trees, Representing Binary Trees in memory, Traversing Binary Trees, Traversal Algorithm using Stacks, Threads, Binary Search Trees, Searching and inserting in Binary Search Trees, Heap, Heap sort, Huffman's Algorithm.

**Unit V.**

**AVL Trees and B-Trees** **(13)**

AVL Trees: AVL Balance Factor, Balancing Trees, AVL node structure, AVL insert, AVL Delete Algorithm. B-Trees: B-Tree insertion, Deletion, Traversal, Search.

**Graphs**

Graph Theory Terminology, Sequential representation of Graphs, Adjacency matrix, Path matrix, Warshall's Algorithm, Linked representation of a Graph, Operations on Graphs, Traversing a Graph, Topological Sorting.

**Text Books:**

1. Seymour Lipschutz, *Theory and Problems of data Structures*, Schaum's Series, Schaum Series, 1985.
2. Gilberg, F Richard & Forouzan, A Behrouz, *Data Structures A Pseudocode approach with C,* Thomson Brooks/Cole Publications, 2004

**Reference Books:**

1. Tanenbaum Aaron M, Langsam Yedidyah, Augenstein J Moshe, *Data Structures using C*, Pearson Education, New Delhi, 2005.
2. Tremblay J.P and Sorenson P.G, *An introduction to data structures with applications*, Tata McGraw Hill, 2nd Edition, 1997
3. Robert Kruse, Tondo C L, Bruce Leung, *Data Structures & program Design In C*, Pearson Education, second Edition, 2004

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA236 Microprocessors and Interfacing Techniques

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Microprocessor 8085** **(12)**

Introduction to Microprocessor 8085 –Signals -Address Bus, Data Bus, Control & status signals, Power supply and Frequency signals, Externally initiated signals, serial I/O ports

**8085 Machine cycles and bus Timings**

Opcode Fetch Machine cycle, Memory Read Machine cycles, Calculation of execution time for a program with examples

**Unit II.**

**Architecture of 8085 MPU** **(11)**

Registers, Flags, ALU, Timing and Control Unit, Interrupt Control Unit, Instruction Decoder, Serial I/O Control, Stack, PC, Address/Data Buffers

**Unit III.**

**Introduction to 8085 programming** **(12)**

Instructions – Classification, Format, Addressing Modes, Programming Techniques, Delays, Subroutines, Sample programs, Timing analysis of instructions.

**Unit IV.** **(13)**

**Assembly Language programs:** Binary and BCD addition of two 32 bit numbers, Binary and BCD subtraction of 16 bit number, Multiplication and division of 8 bit numbers, shifting 8 bit number by 1or 2 bit etc.,.

**Interrupts**

Introduction – INTR, TRAP, RST 7.5, 6.5, 5.5 – RST, SIM and RIM instructions

**Unit V.**

**8255A** **(12)**

Programmable peripheral interface – Block Diagram – Control Logic, Control Word – Modes of operations with examples, Mode 0, Mode 1, BSR Mode, Control word for each modes of operation Programming in 8255A with an example

**Text Book:**

1. Goankar Ramesh.S, *Microprocessor Architecture, Programming & Applications With 8085/8080a*, ISBN 81-224-0710-2, Penram International, 5th Edition, 2005

**Reference Books:**

1. Hall.D.V., *Microprocessor and Digital System*, McGraw Hill Publishing Company, 2nd Edition, 1990.
2. Charles M Gilmore, Pal Ajit, *Microprocessor Principles and Applications*, Tata McGraw Hill, 2nd Edition, 1990.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA251 Data Structures Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

1. Implement stacks.
2. Implement queues.
3. Implement sequential search and binary search techniques.
4. Implement linked lists and some operations on linked lists.
5. Implement doubly linked lists.
6. Implement Circular linked lists.
7. Implement Binary trees and perform the operations.
8. Implement AVL trees.
9. Implement Bubble sort.
10. Implement Selection sort.
11. Implement Shell sort.
12. Implement Heap sort.
13. Implement Quick sort.
14. Implement Insertion sort.
15. Implement Merge sort.
16. Implement Radix sort.
17. Write a program to convert an infix expression to the postfix form.
18. Write a program to evaluate a postfix expression.
19. Implement Depth First Search.
20. Implement Breadth First Search.

## QUESTION PAPER PATTERN

Two questions will be selected by the examiners. Students have to write and execute both the programs.

# MCA252 Assembly Language Programming Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

Write assembly language programs for the following:

1. Write a program to add N one byte number.
2. Write a program to add two digit BCD numbers.
3. Write a program to interchange N one bytes of data.
4. Write a program to check whether the 4th bit of a number is zero or one.
   Display FF if 1 otherwise display 00.
5. Write a program to find the first 10 terms of a Fibonacci sequence
6. Write a program to find sum of first 10 terms of odd and even series.
7. Write a program to check whether a byte belongs to the 2-out-of-5codes. Display FF if it is a 2-out-of- 5 code otherwise00.
   (Number is 2-out-of-5 code if the left most three bits are zero and in the remaining five bits there are exactly two 1's)
8. Write a program to perform linear search over a set of N numbers.
   Display FF and its position if found otherwise 00.
9. Write a program to add two 32 - bit binary numbers.
10. Write a program to add two 32 - bit BCD numbers.
11. Write a program to subtract a 16 - bit number from another 16 - bit number.
12. Write a program to subtract a 16 - bit BCD number from another 16 – bit BCD number.
13. Write a program to multiply two 8 - bit number.
14. Write a program to divide a 16 - bit number by an 8 - bit numbers.
15. Write a program to find the largest and smallest of N numbers.
16. Write a program to display a message "HELLO"
17. Write a program to sort the numbers in ascending and in descending and in descending order using bubble sort.
18. Write a program to display a rolling message.
19. Write a program to determine the HCF of two one byte numbers.
20. Write a program to display FF and 00 alternatively with 1.5 sec delay.
21. Write a program to check whether a one byte number is a palindrome or not.
22. Write a program to prepare a look-up table for the squares of one -digit BCD numbers.
23. Write a program to simulate the throw of dice.
24. Write a program to determine the LCM of two one byte numbers.
25. Write a program to simulate a BCD counter to count from 0 to 100.
26. Write a program to simulate a stopwatch with a provision to stop the watch.
27. Write a program to implement block move with the without overlap condition.

## QUESTION PAPER PATTERN

Two questions will be selected by the examiners. Students have to write and execute both the programs.

## MCA271: Seminar-1

Students have to select a topic and prepare the synopsis and detailed report after review by the faculty guide. Student has to give one hour presentation to a panel of guides and students. Presentation is followed by question and answer session.

# MCA331 Object Oriented Programming using C++

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Introduction to Object-Oriented Programming (12)**

Evolution of programming methodologies, Procedural Approach Vs Object-Oriented Approach. Principles of OOP: Encapsulation and Abstraction, Message Passing, Inheritance – Reusability, Extensibility, Polymorphism – Overloading, , Dynamic Binding.

**Comparison of C and C++**

Limitations of C, Introduction to C++, Structure of the C++ program, Added features of C++ over C – Storage Classes, Reference variables, Inline functions. Simple I/O using cin & cout, I/O formatting and I/O functions. Name spaces, and volatile functions.

**Introduction to Objects and Classes**

Defining the class, Defining Data members and member functions, Creating Objects of Class, Access Specifiers – private, public and protected. Scope Resolution Operator, Friend Functions and Friend Classes – Static Members. this pointer, returning values using this pointer. Comparison of class with structure.

**Unit I.**

**Constructors and Destructors (12)**

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

**Pointers in C++**

Pointer declaration and Access, Pointer to void, pointer and arrays, pointer to pointer, pointer to functions, call by pointer, pointer arrays, Jagged array, array of pointers to string, pointer sort, memory management – new and delete, pointer to object – referencing members using pointers, self referencing class, wild pointers.

**Unit II.**

**Polymorphism (11)**

Overloading Concepts Function Overloading: Functions with different sets of parameters, default and constant parameters. Operator Overloading: Defining Operator Function, Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading Comma, [], (), ->, new, delete Operators. Type Conversions : Basic to Class, Class to Basic and one Class to another Class type. Advanced Type Casting.

**Unit III.**

**Inheritance (12)**

Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specifier in Base class – public, private & protected inheritance – constructors and destructors in derived classes – Types of Inheritances. Virtual base class.

**Virtual Functions**
Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract classes.

**Unit IV.**

**Console I/O operations** **(13)**
C++ streams and C++ stream classes – Predefined Objects, unformatted I/O operations, Formatted I/O operations - manipulators - User defined manipulators - Overloading << and >> Operators for Objects.

**Disk I/O Operations**
Stream Classes, classes for file stream operations, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple objects, file pointer specifying the position, tellg() and seekg(), seekp() and tellp().

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

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

**Text Books:**

1. Deitel & Deitel, *C++ How to program*, Pearson Education Asia, 3rd Edition, 2001
2. Schildt Herbert, *The Complete Reference C++*, Tata McGraw Hill, 4th Edition, 2003

**Reference Books:**

1. Lafore, Robert, *Object Oriented Programming in Turbo C++*, Galgotia Publications Pvt. Ltd, 2000.
2. E Balagurusamy, *Object Oriented Programming with C++*, Tata McGraw Hill, 2nd Edition.
3. Gaddis Tony*, Starting Out with C++,* dreamtech Press, 3rd Edition, 2002.
4. Sotter A Nicholas and Kleper J Scott, *Professional C++*, Wiley Publishing Inc.

**Question Paper Pattern**

a. Question paper has to be set for the total marks of 100
b. Examination duration is 3 hours
c. The syllabus is divided in to five major units.
d. From each major unit 2 full questions with internal choice (to select one) has to be set.
e. Each full question carries 20 marks
f. Maximum of 3 sub divisions can be there in each full question

# MCA332 Computer Architecture

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction** **(13)**

Basic Model of a Computer – Computer Components.

**Register transfer and Microoperations**

Register Transfer Language – Register Transfer – Bus and Memory Transfers – Arithmetic Microoperations – Logic Microoperations – Shift Microoperations – Arithmetic Logic and Shift Unit.

**Basic Computer Organization and Design**

Instruction Codes – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle – Memory – Reference Instructions – Input-Output and Interrupt.

**Unit II.**

**Microprogrammed Control** **(12)**

Control Memory – Address Sequencing – Microprogram Example – Design of Control Unit.

**Central Processing Unit**

Introduction – Stack Organization – Instruction Formats – Addressing modes – Data transfer and manipulation – Program Control.

**Unit III.**

**Computer Arithmetic** **(12)**

Introduction – Addition and Subtraction – Multiplication Algorithms – Division Algorithms – Floating-point Arithmetic operations – Decimal Arithmetic unit – Decimal Arithmetic Operations.

**Unit IV.**

**Input-Output Organization** **(12)**

Peripheral devices – Input-Output Interface - Asynchronous data transfer – Modes of transfer – Priority Interrupt – Direct Memory Access – Input-Output Processor – Serial Communication.

**Unit V.**

**Memory Organization** **(11)**

Memory hierarchy – Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory – Memory management hardware.

**For Internal Assessment Only:**

Complete Computer Organization – Design of Basic Computer – Design of Accumulator Logic.

**Text Book:**

1. Mano M Morris, *Computer System Architecture*, PHI, 3rd Edition, 2006

**Reference Books:**

1. Stalling Williams. *Computer Organization and Architecture*, Prentice Hall, 4th Edition, 2004
2. John P.Hayes, *Computer Architecture & Organization*, McGraw Hill International Editions, 3rd Edition, 2003

## Question Paper Pattern

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b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA333 System Software

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Machine Structure and Evolution of a programming system (11)**

Introduction to System Software, Components of System Software, Evolution of System Software, Assembler, Loader, Macros, Compilers, Simplified Instructional Computer: SIC machine architecture, SIC/XE machine architecture, SIC programming examples.

**Unit II.**

**Assembler (13)**

Basic assembler functions (SIC assembler, algorithm and data structure), Machine dependent assembler features (Instruction formats and addressing modes, program relocation), Machine independent assembly features (Literals, Symbol defining statements, expressions, program blocks, control sections and program linking), Assembler design options (One pass assembler, multi pass assembler)

**Unit III.**

**Loaders and Linkers (12)**

Basic loader functions (Design of an absolute loader, simple bootstrap loader), Machine dependent loader features (Relocation, program linking, algorithm and data structures for a linking loader), Machine independent loader features (Automatic library search, loader options), Loader design options (Linkage editor, dynamic linking, bootstrap loaders).

**Unit IV.**

**Macro Processor (11)**

Macro Instructions, Features of a macro facility (Macro instruction arguments, Conditional macro expansion, Macro calls within macro, Macro instructions defining macros), Implementation (Two pass algorithm, Single pass algorithm)

**Unit V.**

**Compilers (13)**

**Part1:** Basic elements, Syntactic units and interpreting meaning, Intermediate form (Arithmetic statements, Non-arithmetic statements, Non-executable statements), Storage allocation, Code generation, Optimization (Machine independent, Machine dependent, Assembly phase).

**Part2:** Phases of the compiler (Lexical phase, Syntax phase, Interpretation phase, Optimization, Storage assignment, Code generation, Assembly phase), Passes of a compiler.

**Text books:**

1. Donovan, John, *System programming*, Tata McGraw-Hill, 2003
2. Beck, Leland, *System Software An Introduction to System Programming*, Addison-Wesley, 3rd Edition, 1997

**Reference Book:**

1. Dhamdhere D M, *Systems programming and operating systems*, Tata McGraw-Hill, 1994.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA334 Unix Programming

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to UNIX** **(12)**

Overview of Unix, Unix Internals, Features, Kernel Architecture, System calls.

**The UNIX File System**

Overview of Unix Filer System – System calls for File System

**UNIX Buffers**

Buffer Headers – Structure of the buffer pool – Retrieval of a buffer – Reading and writing disk blocks using System calls: getblk(), brelse(), bread(), breada(), bwrite() - Advantages and disadvantages of the buffer cache.

**Unit II.**

**UNIX Process Management** **(11)**

**The Structure of Processes:** Process States and Transitions - Layout of system memory - Context of a process – Sleep – Implementation of System Calls.

**Process Control:** Process Creation – Signals – Process Termination – Invoking other programs – PID & PPID – Changing the size of a process – The shell – System Boot and the init process - Implementation of System Calls.

**Process Scheduling and Time:** Process Scheduling – System calls for Time – Clock Interrupt Handler - Implementation of System Calls.

**Unit III.**

**UNIX Shell Environment** **(12)**

Types of shells – Features of Bourne, C and Korn shells - Creating files and directories - Listing files and directories - Removing files and directories - File related commands - Disk related commands - File compression - I/O redirection and piping - Background processes - nohup command - killing a process - changing process priorities - Unix Communication - System Administration - Adding and removing users - Disk management.

**The vi Editor:** Review of vi Operations – Different Modes – Cursor Movement Commands - Edit Commands - Saving and Exiting - Accessing Multiple Files - Interacting with Unix - Macros - Miscellaneous Commands - Alphabetical List of Keys - Setting Up vi.

**Unit IV.**

**Unix Shell Programming** **(13)**

Shell variables - Shell Keywords - Positional parameters - Passing command line arguments - Arithmetic in shell scripts - Read and Echo - Control Structures - if-then-fi - if-then-else-fi - Nested if - Case control structure – Loops - while-until –for - break and continue - Shell meta characters - Exporting variables - Used defined Functions – System Shell Script files: .profile, .history .. etc. - Debugging Tools for Shell Scripts.

**Memory Management and I/O Subsystem**

**Memory Management:** Swapping – Segmentation – Demand Paging – A Hybrid System with Swapping and Demand Paging – Implementation of System Calls.

**The I/O Subsystem:** Driver Interfaces – Disk Drivers – Terminal Drivers – Streams.

**Unit V.**

**IPC And Multiprocessing (12)**

**Inter Process Communication (IPC):** Process Tracing – System Vs IPC – Network Communications – Sockets – Implementation of System Calls.

**Multiprocessor Systems:** Problem with Multiprocessor Systems – Master and Slave processors – Semaphores – Implementation of System Calls.

**Text Books:**

1. Kernighan W Brian and Pike Rob, *The Unix Programming Environment*, Prentice Hall India, 1st Edition, 1998
2. Yashavant P Kanetkar, *Unix Shell Programming*, BPB Publications, New Delhi, 2004

**Reference Books:**

1. Maurice J Bach, *The Design of Unix Operating System*, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Stan-Kelly-Bootle, *Understanding Unix*, BPB Publications, New Delhi.
3. Vijay Mukhi, *Unix Shells-Bourne-Korn-C*, BPB Publications, New Delhi.
4. Arnold Robbins, *UNIX in a Nutshell*, In a Nutshell series, 3rd Edition, September 1999.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA351 C++ Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

1. Write a Program to Implement Classes and Objects.
2. Write a Program to Implement Constructors and Destructors with array of Objects.
3. Write a Program to Implement Passing and returning parameters by reference.
4. Write a program to demonstrate Function Overloading.
5. Write a program to overload different operators – incr & decr operators with post & pre forms; new, delete, [], () and arithmetic operators.
6. Write a program to perform pointer sort operation.
7. Write a program to demonstrate friend functions and friend classes.
8. Write a program to implement different types of inheritances like Multiple, Multilevel and Hybrid.
9. Write a program to demonstrate the use of Virtual Functions.
10. Write a program to demonstrate the use of abstract classes.
11. Write a program to demonstrate I/O streams and functions.
12. Write a program to Overload << and >> operators as a member and as a non-member operator functions.
13. Write a program to create a file to store some records and search for a particular record and display it.
14. Write a program to demonstrate namespaces and Volatile member functions.
15. Write a program to perform all possible Type Conversions.
16. Write a program to create function Templates, and overload the function Templates.
17. Write a program to create a generic stack class and member functions to perform stack operations.
18. Write a program to implement Exception Handling with minimum 5 exception classes including two built-in exceptions.

## QUESTION PAPER PATTERN

Two questions will be selected by the examiners. Students have to write and execute both the programs.

# MCA352 UNIX Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

**Section – A (Shell Programming)**

1. Write a script to find the number of days between two given dates using functions.
2. Write a script to find the number of unique words in a list of words stored in a file.
3. Write a script function that displays all shell default parameters.
4. Write a script to convert a binary number to its decimal equivalent.
5. Write a script to encode and decode a text file.
6. Write a script to compute the factorial value with and without using recursive functions.
7. Write a script to send a text file to group of users.
8. Write a script to check your home directory to display how many files, directories, and sub-directories are there and display it.
9. Write a Shell Script to prepare and display the Electricity bill with significant considerations.
10. Write a Shell Script to check whether the given number is odd or even and whether is +ve, -ve or zero.

**Section – B (System Programming)**

11. Demonstrate *fork()*, *kill()*, *sleep()* system calls
12. Demonstrate explicit locking and unlocking on a file using *lockf()*
13. Demonstrate process synchronization
14. Create a file and read, write operations using different child process
15. Demonstrate data sharing between process using Files
16. Implement sorting using pipes
17. Demonstrate FIFO's
18. Implement Message Queues
19. Demonstrate Semaphores
20. Demonstrate Threads

**QUESTION PAPER PATTERN**

Two questions will be selected by the examiners (one form section A and one from section B). Students have to write and execute both the programs.

# MCA353 DBMS Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

1. DBMS Lab includes an application project. The backend of the project may be any one of the following:
    - MS-SQL Server
    - Oracle
    - DB2
    - MySql
2. User interface could be made with any one of the front end tools available.
3. Students should have in-depth knowledge of the front and backend tool, which they are using.
4. Database tables are required to be normalized, at least to the second level.
5. There need to be independent forms for data entry operations.
6. All the forms in the project need to have similar look and feel in terms of background/foreground color, arrangement of controls, spacing and sizing of the controls, size of forms, etc.
7. There could be separate forms for searching purposes.
8. Master table data entry forms may include navigational buttons along with Add, Save, Delete etc.
9. Reports should be generated dynamically.

Note: Project should be developed by following software engineering process

# ELECTIVES
# MCA341A Server Side Programming

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.** **(12)**

**HTML:** Introduction-Document type, structure, styles, block and Inline elements, special characters, div, lists, images, links, text, tables, page layout with tables, frames, forms.

**Cascading style sheets:** Introducing CSS, Creating style rules, Fonts, text, Padding, Margin, Borders, colors, Backgrounds and Tables. Element Positioning

**Unit II.** **(11)**

**JavaScript:** JavaScript-background, code, events, JavaScript in HTML, practical examples. Dynamic DHTML- Need, Works, DOM, Compatibility, Examples. DHTML with CSS-properties and filters. Introduction to server side scripting.

**Unit III.** **(12)**

**PHP :** Configuring PHP, Creating a simple PHP program, variables, Operators and Expressions. Accessing PHP and HTTP Data, Concept of state, Loops and arrays, Configuring PHP for error handling, Form validation, Handling Errors. User – defined function in PHP. Scope of variables, includes & require statements, File & Directories.

**Unit IV.** **(12)**

**PHP and XML:** XML-What is XML, Document Structure, PHP and XML, PHP4 and PHP5 XML functions.

**PHP and MySQL**: Connecting to MySQL from PHP. Connection functions and handling errors. Creating database and Retrieving Data using PHP, Creating a user registration script, an access logger script and a user manager.

**Unit V.** **(13)**

**Perl :** Working with simple values. Lists and Hashes. Loops and Decisions. Regular Expressions. Files and Data. Understanding Subroutines. Perl command line switches. Perl standard modules.

**CGI :** Introduction to CGI setting up Perl CGI on Windows and UNIX, CGI scripts and debugging CGI scripts. CGI security.

**Text Book:**

1. Bryan Pfaffenberger, Steven M. Schafer, Chuck White and Bill Karow *HTML, XHTML and CSS Bible* –Wiley-Eastern Private Ltd., 3rd Edition, 2004
2. Mercer W.Dave, Allan Kent, Steven D Nowichi, David Mercer, Dan Squier, Wankyer Choi *Beginning PHP5* Wiley – Dreamtech India Pvt. Ltd., 2004
3. Cozens Simon - *Beginning Perl* Shroff Publishers and distributors, 2000

**References :**

1. Mike McMillan *Perl from the Ground UP* –Tata McGraw-Hill Publications.
2. Tim ConversevJoyce Parh *PHP5 and MYSQL Bible* — Wiley dreamtech
3. Don Gosseling *Java Script* — Vikas Publications

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA341B Parallel Computing

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Parallel computer model (13)**

The state of computing: Computer Development Milestones, Elements of Modern Computers, Evolution of Computer Architecture, System Attributes to performance.

Multiprocessors and Multicomputers: Shared-Memory Multiporocessors, Dustributed-Memory Multicomputers, A Taxonomy of MIMD Computers.

Processor Arrays, Multiprocessors and Multicomputers: Processor Organizations, Multiprocessors, Flynn's Taxonomy, the PRAM model of Parallel Computation.

**Unit II.**

**Conditions of Parallelism (11)**

Data and Resource Dependences, Hardware and Software Parallelism, The role of compilers.

Program Partitioning and Scheduling: Grain sizes and Latency, Grain Packing and Scheduling, Static Multiprocessor Scheduling.

**Unit III.**

**Parallel Computing paradigms (13)**

Synchronous computation, Taxonomy of parallel algorithms, Design of parallel algorithms, parallel programming support, paradigms for parallel algorithm: Binary tree paradigm, Growing by doubling, Pointer jumping technique, divide and conquer, partitioning.

Design of simple algorithms: Scalar product of vectors, Matrix multiplication, partial sums, Binomial coefficients and Range minima problem.

**Unit IV.**

**Tree Algorithms (11)**

Euler circuits, Rooting a tree, Post order numbering, number of desendants, Lowest common ancestor, Tree Contraction, Arithmetic Expression Evaluation.

**Unit V.**

**Searching and Sorting Algorithms (12)**

Sequential searching, Parallel search in CREW PRAM, Parallel search in more data, searching in unsorted array, Merging by Ranking, Bitonic merging, Sequential sorting algorithms – Bubble sort,Insertion sort, Shell Diminishing increment sort, Heap Sort, Merge sort, Sorting networks.

**Text Books:**

1. Hwang Kai, *Advanced Computer Architecture, Parallelism, Scalability Programmability*, McGRAW-HILL International publications, 2003
2. C. Xavier and S. S. Iyengar, *Introduction to parallel Algorithms*, Wiley-Interscience publications, 1998
3. Quinn, J Michael, *Parallel Computing Theory and Practice*, McGraw Hill,Inc, 2nd Edition, 2005

**Reference Book:**

1. Ananth Grama, Anshul Gupta, George Karypis & Vipin Kumar, *Introduction to Parallel Computing.* PHI

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA341C Database Administration

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I. Introduction and Oracle 10g Architecture (12)**

Introduction: General Definition of DBA and Security, System Management & Database Design Roles of DBA – DBA Job Classification. Types of Databases: Online Transaction Processing System and Decision Support System Databases, Development, Test & Production Databases. Daily Routine of a DBA.

Architecture: Database Structures- Logical & Physical, Trace Files, Data Files & Tablespaces, Oracle Managed Files. Processes- Interaction between User & Oracle Processes, The Server Process, Background Processes. Memory Structures- SGA, PGA. Oracle Transactions- Anatomy of SQL Transactions. Data Consistency & Concurrency- Database Writer & Write Ahead Protocol, The System Change Number, Undo Management. Backup and Recovery Architecture-User managed, RMAN, Flashback Techniques. Data Dictionary and Dynamic Performance Views-Data Dictionary, V$ views, The Oracle Optimizer. Oracle utilities, Automatic Database Management, Advisory Framework.

**Unit II. Database Installation and Creation (12)**

Installing Oracle 10g: Following OFA, System and Owners Pre-Installation Tasks, Installing Software, System Administrator and Oracle Owner's Post-Installation Tasks, Uninstalling Oracle 10g.

Database Creation: Creating SPFILE and pfile, Initialization Parameters, Creating a new Database, Using SPFILE, Starting up and Shutting Down Database.

**Unit III. Database Connectivity and Networking, User Management and Security (13)**

Database Connectivity and Networking: Working of Oracle Network – instance names, global database names, connect descriptors, identifiers and strings, Establishing Connectivity, Oracle Client, Installing the Client, Naming and Connectivity – Local, Easy connect, External and Directory naming methods.

Managing Users: Creating, altering and dropping users, Creating user Profiles & Resources, Database Resource Manager, Controlling Access to Data – Roles, Privileges and using Views, Stored Procedures to Manage Privileges, Auditing Database – Standard Auditing, Authentication – Database, External, Centralized user and Proxy Authentication. Database Security Do's & Don'ts-User Accounts, Passwords, OS authentication, Auditing Database, Granting Appropriate Privileges, Permissions, Application Security.

**Unit IV. Data Loading (11)**

Loading and Transforming Data: Overview of extraction loading and Transformation, Loading Data-Using the SQL Loader Utility, Using External Tables to Load Data. Overview of Common Techniques used for Transforming Data.

Data Pump Technology: Introduction, Benefits, Uses and Components of Data Pump. Access method, Data Pump Files, Privileges, Mechanics of Data Pump Job.

**Unit V. Backup, Recovery & Database Performance Tuning (12)**

Backing Up Oracle Databases: Backup Terms, Guidelines, Strategies, Examining Flash Recovery Area – benefits of Flash recovery Area, Looking into Flash Recovery Area, Setting size of Flash Recovery Area Creating Flash Recovery Area, Backing up Flash Recovery Area, RMAN – Benefits, Architecture, Connecting to RMAN.

SQL Query Optimization: Approach to Performance Tuning, Optimizing Oracle Query Processing, Cost-based Optimizer, Drawbacks of CBO. SQL Performance Tuning Tools – EXPLAIN PLAN, Autotrace, SQL Trace and TKPROF.

Tuning the instance: Introduction, Automatic Tuning vs. Dynamic Views. Tuning Oracle Memory: Tuning Shared Pool – Library Cache, Dictionary Cache, Hard vs. Soft Parsing, Sizing Shared Pool, Tuning Buffer Cache – Sizing buffer Cache, Multiple pools for Buffer Cache, Tuning Large, Streams and Java Pools. Tuning PGA Memory – Automatic PGA Memory Management.

Introduction to iSQL*Plus: Installation, configuration, Starting and Stopping iSQL*Plus, Logging into and disconnecting from iSQL*Plus.

**Text Book :**

1. Alapati, Sam R., *Expert Oracle Database 10g Administration*, Springer India Pvt. Ltd., 2005

**Reference Books:**

1. Kyte, Thomas, *Expert Oracle*, Oracle Press Publication, Signature Edition, 2005.
2. Day, John & Craig Van Slyke, *Starting Out with…Oracle*, Dreamtech Publication.
1. Loney, Kevin & Koch, George, *Oracle9i The Complete Reference*, Author's Press/ dreamtech Publication.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA341D Embedded Systems

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to Embedded Systems (13)**

An embedded system overview, Design challenge- optimizing Design metrics, Processor Technology, IC Technology, Design Technology, Trade-offs.

**Introduction to Micro controllers**

Micro controllers and embedded processors, Overview of 8051 family: Micro controller hardware, input/output pins, ports, circuits, External memory, Counters and Timers, Serial data/Input/Output, Interrupts.

**Unit II.**

**Assembly Level Language Programming (13)**

Introduction to 8051 Assembly Programming, Data types and Directives, 8051 Flag bits and PSW register , 8051 Register Bank & stack.

**Instructions and programming**

Address modes, JUMP, CALL and LOOP instructions, Arithmetic Instructions and Programming, Logical Instruction and Programming, Single bit instruction & Programming

**Unit III.**

**I/O Port Programming (12)**

Pin description of 8051, I/O programming: Bit manipulation.

**Timer/Counter Programming in the 8051**

Programming 8051 Timers, Counter Programming.

**Unit IV.**

**8051 Serial Communication (11)**

Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming

**Interrupts Programming**

8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupt, Interrupt priority in the 8051

**Unit V.**

**Real world Interfacing (11)**

Interfacing an LCD to the 8051, 8051 Interfacing to ADC, Sensors, Interfacing to stepper motor, 8051 Interfacing to the keyboard, Interfacing a DAC to the 8051

**Text Books:**

1. Mazidi,Mohammad Ali and Mazidi, Janice Gillispie, *The 8051 Micro controller and embedded Systems*, Pearson Education Asia, 2002.
2. Vahid, Frank and Givargis,Tony, *Embedded system design,* John Wiley & sons, 2003
3. Kamal Raj, Embedded Systems Architecture, Programming and Design, Tata McGraw Hill Publications, 2006

**Reference Book:**

1. Dr. K.V.K.K. Prasad, *Embedded/Real-Time Systems: Concepts, Design and Programming – The Ultimate Reference*, Dreamtech Press.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

**MCA371: Seminar-1I (Only CIA)**

Students have to select a topic and prepare the synopsis and detailed report after review by the faculty guide. Student has to give one hour presentation to a panel of guides and students. Presentation is followed by question and answer session.

# MCA431 Computer Networks

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction** **(12)**

Uses of Computer Networks, Network Hardware: LAN, MAN,WAN, wireless network, Internetworks, Network Software-protocol hierarchies, Design issues for the layers, Interfaces and services, connection oriented and connectionless services, service primitives, Reference Models-OSI,TCP/IP, Comparison of OSI and TCP reference models .

**The Physical Layer**

Transmission media, Wireless transmission, Narrowband ISDN, Broadband ISDN and ATM.

**Unit II.**

**The Data Link Layer** **(13)**

Data Link layer design issues, Error Detection and Correction, Elementary Data Link protocols- unrestricted protocol, simplex stop & wait protocol, simplex protocol for a noisy channel, Sliding Window protocols-one bit sliding window protocol, protocol using Go back N, Example Data link protocol- Higher Level Data Link Control, Data link layer in the internet, Point-to-point protocol

**The Medium Access Sublayer**

The Channel Allocation problem, Multiple access protocols:- pure ALOHA, slotted ALOHA, Carrier sense Multiple access protocols: CSMA with collision detection, collision free protocols: A bit map protocol, Binary countdown, Limited contention protocol, Adaptive Tree walk protocol, GSM, CDMA, IEEE standard 802 for LANs and MANs: Ethernet cabling, Manchester coding , Differential Manchester Coding, High-Speed LANs, Satellite Networks.

**Unit III.**

**The Network Layer** **(12)**

Network layer design issues, Routing algorithms-Optimality principle, shortest path routing, Flooding, flow based routing, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing, Congestion control algorithms: congestion prevention policies, Traffic shaping, Congestion control in virtual circuit subnets, choke packets, Load shedding, Jitter control, congestion control for multicasting, Internetworking, The Network layer in the Internet.

**Unit IV.**

**The Transport Layer** **(12)**

The Transport service, Elements of Transport protocols: addressing, Establishing a connection, Releasing a connection, Flow control and buffering, Multiplexing, Crash recovery, A simple Transport protocol, The Internet Transport protocols (TCP and UDP), Performance Issues.

**Unit V.**

**The Application Layer** **(11)**

Network Security, DNS-Domain Name System, SNMP-Simple Network Management protocol, Electronic Mail, The World Wide Web.

**Text Book:**

1. Tanenbaum, Andrew S, *Computer Networks*, Pearson Education,4th Edition, 2003.
2. Tanenbaum, Andrew S, *Computer Networks*, Pearson Education,3rd Edition, 2001.

**Reference Books:**

1. Forouzan, Behrouz A., *Data Communications and Networking*, TATA Mc-Grow-Hill publications, 2nd Edition, 2003.
2. Stallings, William, *Data & Computer Communications*, Pearson Education Asia, 6th Edition, 2001.
3. Michael A. Gallo, *Computer Communications and Networking Technologies*, Thomson Brooks/Cole, 1st Edition, 2002.
4. William A. Shay, *Understanding Data Communication and Networks*, Vikas Publishing House, 2nd Edition, 2001.

**Question Paper Pattern**

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA432 Computer Graphics with Open GL

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.** **(12)**

**Conceptual overview of computer graphics** Algorithmic generation of basic Primitives (lines, circles, ellipses), two dimensional transformation concepts-Translation, rotation, scaling with matrix representation, homogeneous Co-ordinates, concept of window, window to view port transformation, Line Clipping algorithms-Cohen-Sutherland, Mid-point division and Liang-Barsky Algorithms, Polygon Clipping-Sutherland-Hodgeman Algorithm.

**Unit II.**

**3D viewing and modeling** **(12)**

Viewing pipeline, viewing co-ordinates, View plane transformations, parallel projection, perspective projection, View volumes, matrix representation for 3D transformations, Projection Transformation, View port transformation, Clipping planes.

**Unit III.**

**Color and Lighting** **(12)**

Properties of light, achromatic light, chromatic colors, color models-YIQ, CMY, HSV Light sources, illumination models, ambient light, diffuse Reflection, specular reflection.

**Unit IV.**

**Curves and surfaces** **(12)**

Spline representations, interpolation and approximation splines, continuity conditions, Cubic spline interpolation, Bezier curves and surfaces, B-spline curves and surfaces, Beta splines.

**Unit V. OpenGL (limited to built-in functions not complete programs)** **(12)**

**Introduction to OpenGL**

What is OpenGL, Sample Code, OpenGL Command Syntax, OpenGL as a State Machine, OpenGL Rendering Pipeline.

**OpenGL Built-in Functions**

Implementation of Translation, Rotation, Scaling and Composite Transformation in OpenGL, Troubleshooting transformations in Open GL, Specifying color and Shading Model in OpenGL, Real World and Open GL lighting, Creating light sources in Open GL, Selecting a lighting model in Open GL, GL- Evaluators, one dimensional and two dimensional evaluator in OpenGL.

**Text books:**

1. Donald Hearn , M. Pauline Baker, *Computer Graphics*.PHI, 2nd Edition, New Delhi, Reprint as on 2006.
2. *OpenGL Redbook Version 1.1* (Online)
3. Zhigang Xiang, Roy A Plastock, Adapted by: P S Avadhani, Computer Graphics, Tata McGraw Hill, 2nd Edition, New Delhi, Special Indian Edition 2006.

**Reference Books:**

1. Foley, Vandam & Feiner, Hughes, *Computer Graphics Principles & Practice, Second edition in C,* Pearson Education (Singapore Pvt Ltd, Indian Branch, Delhi) 6th Indian Reprint 2001.
2. Richard S Wright, Jr. Michael Sweet,*Open GL Super Bible*, 2nd Edition
3. Woo, Mason and Neider, Jackie, *Open GL Programming guide*

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA433 Design and Analysis of Algorithms

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

## Unit I.

**Introduction (12)**

The role of Algorithms in Computing – Algorithms, Algorithms as a technology. Getting Started – Insertion sort, Analyzing algorithms, Designing Algorithms. Growth of Functions – Asymptotic Notations, Standard notations and common functions. Recurrences – The Substitution method, Recursion Tree method and Master method.

## Unit II.

**Divide and Conquer (13)**

General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Selection sort, Strassens Matrix Multiplication. Optimal Binary Search Trees

**Greedy Method**

Knap Sack Problem, Minimum Spanning Trees, Traveling Salesman Problem

## Unit III

**Back Tracking (13)**

The 8-queens problem, Sum of Subsets, Depth First Search, Topological Sort, and Strongly connected components.

**Branch n Bound**

General Method, 0/1 Knapsack problem, Traveling Salesman Problem, Breadth first search

## Unit IV

**Graph Algorithms (11)**

Representation of Graph, Single Source shortest path – Dijkstra's Algorithm and Bellman Ford Algorithm. All Pair Shortest Path – Floyd-Warshall Algorithm

**Lower Bound Theory**

Comparison trees for sorting and searching

## Unit V

**NP-Hard and NP-Complete problems (11)**

Basic Concepts, Cook's Theorem, NP_Hard graph problems, NP-Hard Scheduling problems, NP-Hard code generation problems, some simplified NP-Hard problems

**Text Books :**

1. Coremen T H, Leiserson C E, Rivest R L and Stein, Clifford, *Introduction to algorithms,* PHI, 2nd Edition, 2003.
2. Horowitz E and Sahni S. *Fundamentals of Computer Algorithms,* Computer Science Press, 1996.

**Reference Books :**

1. Gelder Van Allen and Baase Sara, *Computer Algorithms – Introduction to Design and Analysis,* Addison Wesley, 3rd Edition, 2000.
2. Aho A V, Hopcroft J E and Ullman J D., *The Design and Analysis of Computer Algorithms,* Addison Wesley Publishing House, 1974.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

g. Theorems are not considered.

# MCA434 Java Programming

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to java Programming (12)**

History of Java. Characteristics of Java. The Java Environment – JVM, JDK & JRE. Different versions of Java. OOP Principles. Comparison of Java with C and C++.

**Language Fundamentals**

Data Types, Expressions, Keywords, Operators and Control Flow Statements. Arrays – Special Types. Java File Structure. Creating and Running Java Programs. Comments in Java.

**Class and Objects**

Creating class and Objects, Methods, this keyword, Constructors. Garbage Collection, the finalize() method. Access Control. Static Blocks. Finals. Nested and Inner Classes. String Class. Command Line Arguments

**Unit II.**

**Inheritance in Java (13)**

Inheritance in classes, Using super, Method overriding, Dynamic Method Dispatch. Abstract Classes, Using final with inheritance, the Object Class.

**Interfaces and Packages**

Inheritance in java with Interfaces – Defining Interfaces, Implementing Interfaces, Extending Interfaces. Creating Packages, CLASSPATH variable, Access protection, Importing Packages

**Exception Handling in Java**

try-catch-finally mechanism, throw statement, throws statement. Packages and Classes for Exception Handling

**Unit III.**

**Input / Output in java (13)**

java.io package, I/O Streams, Readers and Writers, Tokenizing input, Using various I/O classes and FilenameFilter class.

**Multithreading**

Life cycle of a thread, Java thread priorities, Runnable interface and Thread Class. Sharing limited Resources, Shared Object with Synchronization.

**Applets**

Life cycle of Applet, Applet Architecture, Applet restrictions, Applet advantages. Creation and Execution of java Applets.

**Unit IV.**

**GUI Components (AWT & SWING) (11)**

GUI concepts in java, Basic GUI Components in AWT, Container Classes, Layout Managers. Difference between AWT and SWING. SWING Components an Introduction Writing GUI programs in java (with AWT or SWING). GUI Programming with Applications and Applets, Event Handling.

**Unit V.**

**Distributed Computing an Introduction (11)**

Network Programming with Java. JDBC (Java Database Connectivity). Servlets. Java Server Pages. RMI (Remote Method Invocation).

**Text Books:**

1. Schildt Herbert, *Java 2: The Complete Reference*, Tata McGraw-Hill, 4th Edition, 2002
2. Deitel & Deitel, *Java How to Program*, Pearson Education Asia, 3rd Edition, 2001

**Reference Books:**

1. Horton Ivor, *Beginning Java2*, Wiley publishing Inc., 1st Edition, 2005.
2. Holzner Steven, *Java2 Black Book*, dreamtech press, 1st Edition, 2002.
3. Gaddis Tony, *Starting out with Java*, dreamtech press, 2004.
4. Eckel Bruce, *Thinking in Java,* Pearson Education Asia, 2nd Edition, 2001
5. Flanagan David, *Java in a nutshell,* O'REILLY, 4th Edition, 2002

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA451 Java Programming Lab

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

**Section – A**

1. Write a program to demonstrate various data types and operators.
2. Demonstrate arrays with arraycopy() method.
3. Demonstrate method overloading and constructor overloading.
4. Demonstrate the usage of static keyword in java – use static data and static block.
5. Demonstrate final keyword with respect to variable, method and class.
6. Demonstrate inner classes in java.
7. Write a program to demonstrate multilevel inheritance and usage of the keywords this & super.
8. Demonstrate abstract class.
9. Demonstrate the usage of interface for multiple inheritance.
10. Differentiate the usage of throw, throws and try-catch-finally by writing a java program.

**Section – B**

11. Demonstrate various I/O streams in java.
12. Demonstrate the Reader/Writer classes in java.
13. Demonstrate the multithreading concept by implementing Runnable interface.
14. Demonstrate the multithreading concept by extending Thread class.
15. Write an applet program and using paint function make some graphics.
16. Write a program to demonstrate the usage of different Layouts in java.
17. Write a java program to demonstrate various GUI components in java (AWT / SWING) with appropriate Event Handling.

**QUESTION PAPER PATTERN**

Two questions will be selected by the examiners (one form section A and one from section B). Students have to write and execute both the programs.

# MCA452 Computer Architecture Project

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

Students should be divided into batches, each batch containing not more than 3 students. It can be either hardware-software or simulation software related to CA principles/algorithms. This lab is intended to practice the principles (theory) that they have studied in Computer architecture. It is entertained to do a hardware related project incorporating innovative/new ideas.

Some of the project titles:

Processor:

- Design of Micro control unit
- Design of LCM processor
- Design of Arithmetic unit
- Design of logic unit
- Design of shift unit
- Design of nano control unit
- Design processor for Recursive functions
- Design of Floating Point Operation processor
- Design of disassembler (converting from object code to Assembly language code)

Memory:

- Memory interleaving
- Design of Associative cache
- Design of Direct mapping
- Design of Set Associative cache
- Virtual memory
- Look-aside cache
- Look-through
- Cache snooping

Bus arbitration:

- Daisy chaining
- Polling
- Independent Request

DMA control

Pipeline:

Instruction pipeline

Arithmetic pipeline

Vector processing

Fault tolerance system

# MCA453 System Software Project

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

Students should be divided into batches, each batch containing not more than 3 students. This lab is intended to practice the principles (theory) that they have studied in System Software.

Some of the Project Titles:

1. Design of two pass assembler.
2. Design of Macro processor.
3. Design of one pass code generator using recursive parser.
4. Design of two pass code generator using recursive parser.
5. Process ALP to target language without using macros.
6. Design a relocated machine opcode ( i.e. In terms of Assembly language code).
7. Design of dynamic loader.
8. Design of direct-linking loader.
9. Design of relocating loader.
10. Design of absolute loader.

# ELECTIVES
# MCA441A .NET Technologies

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to .NET** **(12)**

.NET Definition, Advantages of .NET, .NET Architecture – Common Language Runtime, MSIL, Support of different Languages. Language Interoperability, .NET Framework Classes. Advantages of Managed Code – Strong Data Type Check, Garbage Collection, Security, Performance Improvement.

**C# Basics**

Features of C# – Data types, Flow Control – the Main method, Program Structure, Methods, Arrays, Namespaces.

**Unit II.**

**Object Oriented C#** **(11)**

Classes and Inheritance, Method Overloading, Method Overriding, Calling Base Versions of Methods. Abstract Classes and Methods, Sealed Classes and Methods. Access Modifiers. Properties – Read Only, Write Only Properties. Function – Parameter Passing Mechanisms. Interfaces, Dispose methods. Operator Overloading, Indexers.

**Unit III.**

**Advanced C# Topics** **(11)**

Errors and Exception Handling, Exception Classes, User Defined Exceptions. The STD namespace objects, Array Lists, Collections, Dictionaries. Multi Threading – Synchronization. Delegates – Definition, Delegates in Inheritance. Event handler, Reflection.

**Unit IV.**

**Programming in the .NET Environment** **(13)**

Introduction to Visual Studio .NET – ASP .NET. Difference between ASP and ASP.NET. Creating a Web application using ASP.NET. Components of an ASP.NET User Control, Custom Control, Deploying ASP .NET applications. Master Pages, Themes.

**Assemblies**

Features of Assemblies, Application Domains, Assembly Structure, Assembly manifests, Assemblies and Components.

**Unit V.**

**Data Access** **(13)**

ADO.NET overview. Various data access objects – Connection, Command and DataSet Objects. Binding data to ASP .NET server controls. Accessing data from a database using ADO.NET. Reading from and Writing to an XML document, Using XML DOM objects

for data access from XML Documents. Binding data from an XML document to Web form controls. Converting data from Database to XML Data. Xml & Web Services

**Text Books:**

1. Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn, Morgan Skinner and Bill Evjen, *Professional C#*, Wiley – dreamtech India Pvt. Ltd., 3rd Edition, 2004.
2. .NET(Core Reference) Microsoft® Visual C#® 2005: The Language by Donis Marshall
3. Complete-reference-to-professional-soa-with-visual-studio-2005-dot-net-3-0

**Reference Books:**

1. Kothari Nikhil and Datye Vandana, *Developing ASP .NET Server Controls and Components*, Tata McGraw Hill, 2003.
2. Esposito Dino, *Applied XML Programming for Microsoft .NET*, Tata McGraw Hill, 2003.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

d. From each major unit 2 full questions with internal choice (to select one) has to be set.

e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA441B Digital Image Processing

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Digital Image Fundamentals (12)**

Digital image Representation – Fundamental steps in Image Processing - Elements of digital image processing systems – Elements of visual perception – A simple image model – Sampling and Quantization – Some basic relationships between pixels – Imaging geometry.

**Unit II.**

**Image Transforms (12)**

Introduction to the Fourier transform – The Discrete Fourier transform – Some properties of the two dimensional Fourier transform – The Fast Fourier transform – Walsh, Hadamard, Discrete Cosine, Haar, and Slant transforms – The Hotelling transform.

**Unit III.**

**Image Enhancement And Restoration (12)**

Spatial domain and frequency domain methods – Enhancement by point processing – Spatial filtering – Enhancement in the frequency domain – Color fundamentals – Color models – Degradation model – Unconstrained and Constrained restoration – Formulation of inverse filtering – Least Mean Square (Wiener) filter – Geometric transformations.

**Unit IV.**

**Image Compression (12)**

Fundamentals of image compression – Image compression models –Variable length coding – Huffman coding – Arithmetic coding – Bit plane coding – Run length coding – Lossless Predictive coding – Lossy Predictive coding - Transform coding – Image compression standards.

**Unit V.**

**Image Segmentation (12)**

Detection of discontinuities – Edge linking and boundary detection – Thresholding – Basic Formulation of Region oriented segmentation – Region growing by pixel aggregation – Region splitting and merging - The use of motion in segmentation.

**Text Book:**

1. Gonzalez, Rafael C. and Woods, Richard E. *Digital Image Processing*, Addison Wesley, 2nd Edition, 2000.

**Reference Books:**

1. Jain, Anil K. *Fundamentals of digital image processing*, PHI, 2002.
2. B. Chanda and Majumder,D. Dutta. *Digital image processing and Analysis*, PHI, 2002.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA441C Linux Administration

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Installation and Configuration (12)**

Introduction to Linux :What is Linux? History of Linux.Hardware Specifications : Minimum System Requirements, Where to Get Linux?Installation and Up gradation: Installing Linux, Creating Boot and Root discs, Partitioning the Hard Disk, Installing the Linux Partitions, Installing the Linux Software, Setting the Boot Process, Viewing Installed Software Files, Using Package Managers, Troubleshooting.LILO: Installing LILO, Linux and Hard Disk Layouts, Understanding the Boot Sector, Modifying the Boot Process, The Map Installer, Using Boot Images, Reading the Disk Parameter Table, Removing or Disabling LILO, Troubleshooting LILO.

**Unit II.**

**Expanding the System (11)**

Devices and Device Drivers, Device Drivers, Device Files, Character Block Mode Devices, Device Permissions and Links. SCSI Devices
SCSI Chains and devices, SCSI Device Drivers, Trouble Shooting SCSI Devices.
Terminals and Term , Connecting Terminals, Understanding the Login Process, Adding a Terminal, Using stty and tset to Set Terminal Behavior, Resetting a Screwy Terminal, Using the Program.Modems
Installing a Modem, Configuring a Modem, Setting Fast Modem Speeds.

**Unit III.**

**Linux Management (13)**

Booting, using INIT and Shutting Down
Starting Linux, Creating and Using a Maintenance Disk, Shutting down Linux Understanding the init Daemon, Boot Scripts, Using the rdev family.
Users and Logins
Understanding the Superuser Account, Establishing User Accounts,Understanding Default Systems Usernames, Adding Users, Deleting Users, Using Groups, Using the su command.System Names and Access Permissions
Setting a System Name, Using File and Directory Permissions.
File Systems Mounting and Unmounting Files, Managing Disk Space.
Processes Understanding Processes, using the ps command, Using the kill command, Using the top command. Managing System Resources
Understanding Quotas, Setting User Quotas, Using the quota & quotacheck commands.

**Unit IV.**

**Linux Management(Cont.) (13)**

Back up Why make backups, Choosing Backup Media, High-Capacity Tape Drives,Setting a Backup Schedule, Keeping Backup Logs, Using tar for Backups.
Automating Tasks with Scripts

Using the cron Prgoram, Using the at Program
Security Keeping Upto date with Security, Improving Passwords, Securing your Files,Controlling Modem Access, Tracking Intruders.
**Networking**
UUCP Configuring UUCP, UUCP Connection, UUCP Security, Using UUCP.
TCP/IP and Networking Fundamentals
Terminology, TCP/IP, IP Addressing, DNS, Topologies.

**Unit V.**

**Networking(Cont.)** **(11)**

Configuring Network on System
Configuring the Kernel, Setting up PLIP, SLIP and PPP Serial Ports.
Configuring TCP/IP Setup Basics, Configuring PLIP, Gateways.
SLIP and PPP Setting up the Dummy Interface, Setting up SLIP and PPP, Using DNS for SLIP and PPP.
Network Utilities, Loopback Driver, ifconfig, inetd, netstatping, arp, traceroute and rpcinfo commands. NFS, NIS, and DNS NFS, NIS, and YP. NFS Administration, DNS. EMAIL Linux Mail Software, Email Structure, Mail Readers.

**Text Book:**

1. Parker Tim, *Linux: System Administrator's Survival Guide*, 2nd Edition, 1999

**Reference Books:**

1. Graham, Steven & Shah,Steve *Linux Administration*, A beginners Guide, 4th Edition, 2005
2. Komarinski, F. Mark,Cary Collet, *Linux System Administration,* Handbook PHI, 1998

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA441D Embedded Programming and RTOS

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Embedded Programming using C (11)**

Intrinsic routines, Library files, Buffer manipulation, Character conversion and classification, Data conversion, Memory allocation, Stream input and output, String manipulation, Variable length argument lists, Compiler Language Extensions( Data Types, Memory Types, Memory models, Pointers, Interrupt Procedure)

**Unit II.**

**Real time Operating system: (11)**

Typical Real time Applications & Hard versus Real time Applications:
Digital control, High level controls, Signal processing, Other Real time applications, Jobs and processors, Release times, Deadlines and Timing constraints, Hard and Soft Timing constraints, Hard Real time systems, Soft Real time systems:
A reference model of Real time systems:
Processors & Resources, Temporal parameters of real time Workload, Periodic Task model, Precedence constraints and data dependency, Other types of dependencies, Functional parameters, Resource parameters for jobs and parameters of Resources, Scheduling hierarchy

**Unit III.**

**Operating systems (12)**

Overview, Threads & tasks, The Kernel, Time services and scheduling mechanism, Time services: clocks & time, Resolution, High resolution, Timers & Timers functions, Asynchronous timer functions, Synchronous timer functions, Timer resolution, Periodic time interrupts, one shot Timer interrupts, Timer accuracy, Release time jitters of periodic tasks
Scheduling mechanisms: Fixed priority Scheduling, EDI scheduling, preemption lock, Aperiodic thread scheduling, monitoring processor time consumption, Tracking busy intervals, Hook for user level Implementation, static configuration , Release Guard mechanism

**Unit IV.**

**Other basic operating system functions (13)**

Communication and synchronization, Event notification and software Interrupts, memory management, I/O and networking
Processor Reserves and Resource kernel:
Resource model and Reservation types, Application program interface and SSP structures
Open system architecture
Objectives & alternatives, Two level scheduler, server maintenance, Sufficient schedulability condition and acceptance test, Scheduling overhead and processor utilization, service Provider structure and real time API Functions

**Unit V.**

**Capabilities of commercial Real time Operating (13)**

LynxOS, pSOSystem, QNX/Neutrino, VRTX, VxWorks

Predictability of General purpose operating systems

Windows-NT Operating system: scheduling, limited priority levels, jobs, jobs scheduling classes, User level NPCS, ceiling priority protocol, deferred procedure calls

Real Time extension of Linux Operating system:

Important features, scheduling, clock and timer resolution, threads, UTIME High resolution Time service

**Text Books:**

1. Liu, Jane S. *Real time systems,* Pearson education, 2000
2. Mukhi, Vijay. *The 'C' Odyssey UNIX,* BPB publications, 2004

**Reference Book:**

1. WilmShurst , Tim. *An Introduction to the Design of small scale embedded systems*, Palgave Macmillan, 2001

**Question Paper Pattern**

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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e. Each full question carries 20 marks

f. Maximum of 3 sub divisions can be there in each full question

# MCA531 TCP/IP & Internet Technology

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**TCP/IP Architecture (11)**

Evolution of open Networks, Layering of communication process, TCP/IP Layering, Internet protocols and standardization process, Internetworking Concept and Architectural Model, Internet Addresses.

**Link Layer**

Physical addresses, IEEE & MAC, ARP –Packet format, encapsulation, operation, ARP over ATM, Proxy ARP, ARP Package-Cache Table, Queues, I/O Module, Cache-Control module. RARP-Packet format, Encapsulation, RARP Server, Alternative solutions to RARP.

**Unit II.**

**ICMP & IP (12)**

ICMP overview, Message Types, ICMP Message format. CIDR – Subnetting, VLSM, Supernetting. IP Routing Principles, Routing IP Datagrams, Dynamic Routing Protocols – RIP, OSPF, HELLO, BGP. PING program. Traceroute program.

**Unit III.**

**UDP , TCP and SNMP (13)**

UDP-Process to Process Communication, User datagram, Checksum, Operation, Use of UDP, UDP Package

TCP-Services, Features, Segment, TCP connection, State Transition Diagram, Flow-Control-Nagel's Algorithm, Clark's Solution, Error-Control, Congestion Control, TCP Timers-RTT, Karn's Algorithm, Options, TCP Package.

SNMP – SMI, MIB, SNMP.

**Unit IV.**

**IP over ATM, Mobile IP and VOIP (12)**

IP over ATM-ATM WANs-Layers, Carrying a datagram in cells, Routing the cells, ATMARP, Logical IP Subnet (LIS).

VOIP – Session Initiation Protocol, H.323 architecture and protocols.

Mobile IP – Addressing, Agents, Three Phases Inefficiency in mobile IP.

**Unit V.**

**Internet Security and Firewall Design (IPsec) (12)**

Introduction, Protecting Resources, Information Policy, Internet Security, IPsec,IPsec Authentication Header, Security Association, IPsec Encapsulation Security Payload, Authentication And Mutable Header Fields, IPsec Tunneling, Required Security Algorithms, Secure Sockets, Firewalls And Internet Access, Multiple Connections And weakest Links, Firewall Implementation, Packet –Level Filters, Security And Packet Filter Specification, The Consequence Of Firewall Architecture, Stub Network, An Alternative Firewall Implementation, Monitoring And Logging.

**Text Books:**

1. Comer E. Douglas, *Internetworking with TCP/IP Principles, Protocols and Architectures*, Volume 1, Pearson Education, 4th Edition, 2002.
2. Behrouz A. Forouzan, *TCP/IP Protocol Suite*, Tata Mc-Grow-Hill publications, 3rd Edition, 2006.
3. Andrew S. Tanenbaum, Computer Networks, PHI, 4th edition, New Delhi, 2003.

**Reference Books:**

1. Hahn Harley, *The Internet Complete Reference*, Tata McGraw-Hill Publishing Company Limited, 2nd Edition, 2002.
2. Siyan S Karanjit and Parker Tim, *TCP/IP Unleashed*, Pearson Education Asia3rd Edition.

## Question Paper Pattern

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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f. Maximum of 3 sub divisions can be there in each full question

# MCA532 Software Project Management

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to Software Project Management (12)**

Introduction, Software project versus other types of projects, contract management and technical project management, activities covered by Software Project Management, plans methods and Methodologies, Categorizing Software Projects, setting objectives stakeholders, business case, requirement specification, Management control.

**Project planning**

**I**ntroduction and various steps in project planning.

**Unit II.**

**Project evaluation (12)**

Strategic assessment, technical assessment, cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, risk evaluation.

**Selection of appropriate Project approach**

Choosing technologies, technical plan contents list, choice of process models, structure versus speed of delivery, waterfall model, V-process model, spiral model, software prototyping, other ways of categorizing prototypes, controlling changes during prototyping, incremental delivery, dynamic systems development method, extreme programming, Managing iterative processes, selecting more appropriate process model.

**Software Effort Estimation**

Estimation Techniques – COCOMO Model.

**Unit III.**

**Activity planning (12)**

Objectives, When to plan, project schedules, projects and activities, sequencing and scheduling the activities, network planning models, formulating a network model, adding time dimension, forward pass, backward pass, identifying critical path, activity float, shortening project duration, identifying critical activities, activity-on-arrow networks.

**Risk Management**

**N**ature of risk, types of risk, managing risk, hazard identification, hazard analysis, risk planning and control, evaluating risks to the schedule.

**Unit IV.**

**Resource allocation (12)**

Nature of resources, identifying resource requirements, scheduling resources, creating critical paths, counting the cost, publishing resource schedule.

**Monitoring and control**

Creating framework, collecting data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

**MS- Project.**
Introduction, Overview of MS-Project, Project Scope,Time,Cost,Human Resource, Communications management.

**Unit V.**

**Managing people and organizing teams (12)**
Understanding behavior, organizational behavior: a background, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, stress, health and safety.

**Software quality**
Place of software quality in project planning, importance of project quality, defining software quality, ISO 9126, practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality, quality plans.

**Text Books:**

1. Hughes, Bob and Cotterell, Mike, *Software project Management*, 3rd OR 4th Edition, TMH, 2005
2. Kathy Schwalbe, *Information Technology Project Management,* Vikas Publishing House, 2004

**Reference Books:**

1. Kieron Conway, *Software Project Management – From Concept to Deployment,* Dreamtech Press, 1st Reprint Edition, 2002
2. Kelkar S. A,*Information Technology Project Management, A concise study*, PHI, 2005
3. Royce, Walker, *Software project Management A unified Framework*, Pearson Education, 2006

**Question Paper Pattern**

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b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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# MCA533 Artificial Intelligence And Expert Systems

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Intorduction** **(11)**

What is AI? The Foundations of AI, What is an AI Technique?-Tic-Tac-Toe.

**Problems, Problem Spaces and Search**

Defining the problem as a state space search, Production systems, Problem characteristics, production system characteristics, Issues in the design of search programs.

**Unit II.**

**Heuristic Search Techniques** **(11)**

Generate-and-test, Hill climbing, Simulated Annealing, Best-First search, A* algorithm, AO* algorithm, Constraint satisfaction, Means-Ends Analysis.

**Unit III.**

**First-Order Logic** **(13)**

Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic, Representing Change in the world, Deducing hidden properties of the world.

**Interface in First-Order Logic**

Inference rules involving Quantifiers, An Example proof, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution, Completeness of Resolution.

**Unit IV.**

**Slot-and-Filler Structures** **(13)**

Semantic Nets, Frames, Conceptual Dependency.

**Game Playing**

Overview, The Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

**Unit V.**

**Natural Language Processing** **(12)**

Introduction, Syntactic processing, Semantic analysis.

**Expert Systems**

Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

**Text Books :**

1. Rich, Elaine and Knight, Kevin, *Artificial Intelligence,* Tata McGraw-Hill publications, 2nd Edition, 2006
2. Russell, Stuart and Norvig, Peter, *Artificial Intelligence A Modern Approach,* Pearson Education,

**Reference Books:**

1. Eugene Charniak and Drew McDermott, *Introduction to Artificial Intelligence*, Addison Wesley, Pearson Education, 2005
2. George F Luger, *Artificial Intelligence Structures and Strategies for Complex Problem Solving,* Pearson Education Ltd., 2nd Edition, 2002.
3. Dan W Patterson, *Introduction to Artificial Intelligence and Expert Systems*, Prentice-Hall of India, 2001.

## Question Paper Pattern

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b. Examination duration is 3 hours

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# MCA534 Distributed Computing Systems

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.**

**Introduction to Distributed Systems**
**(11)**

Introduction -- What is a Distributed System? – Goals – (Advantages of Distributed Systems over Centralized Systems, Advantages of Distributed System over Independent PCs, Disadvantages of Distributed Systems) – Hardware Concepts – (Bus-Based Multiprocessors, Switched Multiprocessors, Bus-Based Multicomputers, Switched Multicomputers) – Software Concepts – (Network Operating Systems, True Distributed Systems, Multiprocessor Timesharing Systems) – Design Issues – (Transparency, Flexibility, Reliability, Performance, Scalability)

**Unit II.**

**Communication in Distributed Systems (12)**

Introduction Asynchronous Transfer Mode Network – (What is Asynchronous Transfer Mode?, ATM Physical Layer, ATM Layer, ATN Adaptation Layer, ATM Switching) – The Client-Server Model – (Client and Servers, Addressing, Block versus Nonblocking Primitives, Buffered versus Unreliable Primitives) – Remote Procedure Call – (Basic RPC Operation, Parameter Passing, Dynamic Binding, RPC Semantics in the Presence of Failures) Distributed objects and remote invocation : Introduction, Communication between distributed objects, Java RMI case study

**Unit III.**

**Synchronization in Distributed Systems (13)**

Introduction -- Clock Synchronization – (Logical Clocks, Physical Clocks, Clock Synchronization Algorithms) – Mutual Exclusion – (A Centralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm) – Election Algorithms – (The Bully Algorithm, A Ring Algorithm) – Atomic Transactions – (Introduction to Atomic Transactions, The Transaction Model. Implementation, Concurrency Control) – Deadlocks in Distributed Systems – (Distributed Deadlock Detection & Prevention)

**Unit IV.**

**Processes and Processors in Distributed Systems (13)**

Introduction – Threads – (Introduction to Threads, Threads Usage, Design Issues for Threads Packages,) – System Models – (The Workstation Model, Using Idle Workstations, The Processor Pool Model, A hybrid Model) – Processor Allocation – (Allocation Models, Design Issues for Processor Allocation Algorithms, Implementation Issues for Processor Allocation Algorithms, Example Processor Allocation Algorithms) – Scheduling in Distributed Systems – Fault Tolerance – (Component Fault, System Failures, Synchronous versus Asynchronous Systems, Use of Redundancy, Fault Tolerance Using Active Replication, Agreement in Fault Systems)

**Unit V.**

**Distributed File Systems** **(11)**

Introduction – Distributed File System Design – (The File Service Interface, The Directory Server Interface, Semantics of File Sharing) -- Distributed File System Implementation – (File Usage, System Structure, Caching, Replication, An Example: Sun's Network File System).

**Distributed Shared Memory:** Introduction, What is Shared Memory? , Consistency Models, Page-Based Distributed Shared Memory.

**Text Books:**

1. Tanenbaum S Andrew, *Distributed Operating Systems,* Pearson Eduction Asia, 2001
2. Singhal Mukesh, Shivaratri G Niranjan, Advanced Concepts In Operating Systems Distributed Data Base, And Multiprocessor Operating Systems, McGraw-Hill, Inc., 2002

**Reference Book:**

1. George Colulouris , Jean Dollimore, Tim Kindberg, Distributed systems-Concepts and Design, Second edition, Addison_Wesely
2. Sinha K Pradeep, *Distributed Operating Systems Concepts and Design*, Eastern Economy Edition, 2001

**Question Paper Pattern**

a. Question paper has to be set for the total marks of 100

b. Examination duration is 3 hours

c. The syllabus is divided in to five major units.

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f. Maximum of 3 sub divisions can be there in each full question

# MCA535 Data Mining and Data Warehousing

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit I.** **(12)**

**Introduction**

What Is Data Mining? Data Mining—On What Kind of Data? Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or DataWarehouse System, Major Issues in Data Mining.

**Data Preprocessing**

Why Preprocess the Data? Descriptive Data Summarization – Measuring the central tendency- Measuring the dispersion of data.

**Unit II.** **(12)**

**Data Preprocessing (cont.)**

Data Cleaning-Missing Values-Noisy Data-Data Cleaning as a Process, Data Integration and Transformation, Data Reduction-Data Cube Aggregation-Attribute Subset Selection-Dimensionality Reduction-Numerosity Reduction.

**DataWarehouse and OLAP Technology**

What Is a DataWarehouse? A Multidimensional Data Model, DataWarehouse Architecture, DataWarehouse Implementation, From DataWarehousing to Data Mining.

**Unit III.** **(12)**

**Data Cube Computation and Data Generalization**

Efficient Methods for Data Cube Computation – Road map - Multiway array aggregation – Star cubing, Further Development of Data Cube and OLAP Technology.

**Mining Frequent Patterns and Associations**

Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods – Apriori algorithm, Generating Rules – Improving efficiency – Mining frequent itemset without candidate generation.

**Unit IV.** **(14)**

**Classification and Prediction**

What Is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree – Decision tree induction – Attribute selection, Bayesian Classification – Bayesian Theorem - naïve Bayesian, Rule-Based Classification, Prediction, Accuracy and Error Measures.

**Cluster Analysis**

What Is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods – K-Means and K-Medoids, Hierarchical Methods – Agglomerative and Divisive, Density Based Methods - DBSCAN, Outlier Analysis – Statistical based.

**Unit V.** **(10)**

**Mining Time-Series and Spatial Data**

Mining Time-Series Data – Trend analysis – Similarity search, Spatial Data Mining-Spatial Data Cube Construction and Spatial OLAP-Mining Spatial Association and Co-location Patterns-Spatial Clustering, Classification Methods-Mining Raster Databases

**Applications and Trends in Data Mining**

Data Mining Applications, Data Mining System Products and Research Prototypes, Social Impacts of Data Mining.

**Text Book:**

1. Jiawei Han and Micheline Kamber, *Data Mining: Concepts and Techniques*, Morgan Kaufmann Publishers, San Francisco, USA, 2nd edition, 2006.

**Reference Books:**

1. Claudia Imhoff, Nicholas & et al, *Mastering Data warehouse Design*, J Wiley, 2003
2. Berson A & Smith S J, *Data warehousing, Data Mining & OLAP*, Mc Graw Hall, 1997.
3. Margaret H. Dunham, *Data mining-Introductory and Advanced topics* Pearson Education, 2003
4. Inmon W H, *Building the Data Warehouse***,** John Wiley & Sons, 3rd edition, 2005

## Question Paper Pattern

a) Question paper has to be set for the total marks of 100

b) Examination duration is 3 hours

c) The syllabus is divided in to five major units.

d) From each major unit 2 full questions with internal choice (to select one) has to be set.

e) Each full question carries 20 marks

f) Maximum of 3 sub divisions can be there in each full question

# MCA551 Computer Networks Project

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

1. Network Security : Cryptography, Stegnography, Digital Signature, Firewall.
2. Network Communication: IPC, IRDA, Radio wave, Bluetooth, Wi-Fi, Mobile Streaming, Client-server, Master-Slave.
3. Network Monitoring.
4. Ad-hoc networking, Remote login & Control
5. Application: e-governance
6. Implementation of different nework protocols (SIP, RTP, RTCP, VOIP, SNMP, ARP, RARP and so on).

# MCA552 Computer Graphics Project

***Total Hours/Semester: 60*** ***No of Hours/Week: 04***

- Simulation.
- Modeling.
- Game.
- Screen Saver (at least 4 screens)
- Creative Natural Scenery.
- Rooms with Lighting Shades.
- Other Innovative Creations.

# MCA553A, MCA553B, MCA553C, MCA553D

***Total teaching Hours/Semester: 60*** ***No of Hours/Week: 04***

**MINI PROJECT : Project based on previous semester's electives.**

# MCA651

# SIXTH SEMESTER PROJECT

***No of Hours/Week: 30***

It is a full time project to be taken up either in the industry or in an R&D organisation.

Certificate course on

# MCA201 CERTIFICATE COURSE ON MICROCONTROLLER

**Number of credits: 2** **Theory : 30 Hours**

**Pre-requisite:**

Basic Knowledge of Microprocessors and Digital Electronics

**Unit I** **(6)**

**Introduction**: Introduction to Micro controllers and Embedded processors, Overview of the 8051 family

**8051 Assembly Language Programming**:

Introduction to 8051 Assembly Programming, Data types and Directives, 8051 Flag bits and PSW register , 8051 Register Bank & stack.

**Unit II** **(7)**

**Instructions and programming**

Address modes, JUMP, CALL and LOOP instructions, Arithmetic Instructions and Programming, Logical Instruction and Programming, Single bit instruction & Programming

**I/O Port Programming:**

Pin description of 8051, I/O programming: Bit manipulation

**8051 Addressing modes**:

Immediate and Register Addressing modes, Accessing memory using various addressing modes

**Unit III** **(6)**

**Arithmetic Instructions and programs**:

Unsigned addition and subtraction, unsigned multiplication and division, signed number concepts and arithmetic operations

**Logic Instructions and programs**:

Logic and compare instruction, Rotate and Swap Instructions, BCD and ASCII application program

**Unit IV** **(5)**

**Single bit Instructions and Programming**:

Single bit Instruction programming, Single bit Instruction operation with CY, reading input Pins vs Port Latch

**Timer/Counter Programming in the 8051**

Programming 8051 Timers, Counter Programming.

**Unit V** **(6)**

**8051 Serial Communication**

Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming

**Real world Interfacing**: LCD, ADC and sensors, stepper motor, keyboard, DAC, Interfacing to external memory;

**Books:**

1. The 8051 Microcontroller and Embedded systems – by Muhammed Ali Mazidi & Jannice Gillespie Mazidi- Pearson Education
2. Embedded Micro Computer System - Jonathan W. Valvano
3. Programming and Customizing 8051 – Mike Predko
4. Fundamentals of Digital logic and very low design by Stephen Brown et al.

## Practical

Duration: 30 hours

1. Write a program to add N one byte number.
2. Write a program to add two digit BCD numbers.
3. Write a program to interchange N one bytes of data.
4. Write a program to check whether the 4th bit of a number is zero or one. Display FF if 1 otherwise display 00.
5. Write a program to find the first 10 terms of a Fibonacci sequence
6. Write a program to find sum of first 10 terms of odd and even series.
7. Write a program to check whether a byte belongs to the 2-out-of-5codes. Display FF if it is a 2-out-of- 5 code otherwise00.

   (Number is 2-out-of-5 code if the left most three bits are zero and in the remaining five bits there are exactly two 1's)
8. Write a program to perform linear search over a set of N numbers. Display FF and its position if found otherwise 00.
9. Write a program to add two 32 - bit binary numbers.
10. Write a program to add two 32 - bit BCD numbers.
11. Write a program to subtract a 16 - bit number from another 16 - bit number.
12. Write a program to subtract a 16-bit BCD number from another 16–bit BCD number.
13. Write a program to multiply two 8 - bit number.
14. Write a program to divide a 16 - bit number by an 8 - bit numbers.
15. Write a program to find the largest and smallest of N numbers.
16. Write a program to display a message "HELLO"
17. Write a program to sort the numbers in ascending and in descending and in descending order using bubble sort.
18. Write a program to display a rolling message.
19. Write a program to determine the HCF of two one byte numbers.
20. Write a program to display FF and 00 alternatively with 1.5 sec delay.
21. Write a program to check whether a one byte number is a palindrome or not.
22. Write a program to prepare a look-up table for the squares of one-digit BCD numbers.
23. Write a program to simulate the throw of dice.
24. Write a program to determine the LCM of two one byte numbers.
25. Write a program to simulate a BCD counter to count from 0 to 100.
26. Write a program to simulate a stopwatch with a provision to stop the watch.
27. Write a program to implement block move with the without overlap condition.

# MCA301Certificate Course on Oracle
# Theory

**Number of credits 2** **Duration: 30 hours**

Unit I. **(5)**

**Fundamentals of Oracle9i**

Introduction to oracle9i, Relational and Object relational Database Management System, Oracle Internet Platform, System Development and Execution Life Cycle, Relational Database Concept, Normalization, Entity Relationship Model, SQL Statement.

**Introduction to Language**

Fundamentals of SQL Statement- SELECT, DELETE, UPDATE, ALTER, TRUNCATE, ALTER, DROP, RENAME, ROLLBACK, COMMIT, SAVEPOINT.

Operators – Arithmetic, Concatenation, Logical, Comparison Operators, Operators precedence ,IS,[NOT]NULL,[NOT] IN,[NOT] BETWEEN, LIKE,EXISTS,WITH.

Sql Expression and Clauses.

Unit II. **(5)**

**Functions , Subqueries, joins and sets**

SQL Functions-Single Row Function, Multiple Row Function, Number Function, Character Functions Returning Character Values , Character Functions Returning Number Values, Datetime Functions, Conversion Functions, Miscellaneous Single-Row Functions, Aggregate Functions, Analytic Functions.

Sub Queries-Single Row Sub Query, Multiple Sub Queries, Top-N Analysis.

Joins: Joins-Equi Join , Non Equi Join, Outer Join, Self Join.

Set: Set- Union, Union All, Intersect, Minus.

Unit III. **(5)**

**Constraints, Privileges and Locks**

Describe constraints, Create and Maintain Constraints, Constraints Types.

Privileges: Create Roles, Create Object, Grant, Revoke, Confirming Privileges Granted

Locks: Types of Locks, Levels of Locks , Modes of Locks, Explicit Locking.

**DataBase Objects For Performance Tuning**

Indexes, Views, Sequences, Clusters, Synonyms, Snapshots

Unit IV. **(8)**

**Introduction to PL/SQL**

Pl/SQL Environment, Benefits PL/SQL , Benefits of Subprograms, Block Structures, Nested Blocks

Variables: Describe the Significance of Variables in PL/SQL, Declaring PL/SQL Variables, Executing PL/SQL Blocks,Delimiters,Identifiers,Literals,Comments.

Types: Scalar, Composite, Reference, LOB(Large Objects), %Type, %RowType

Using SQL Statements in PL/SQL

SELECT,INSERT,UPDATE,DELETE.

Control Structure, Iterative Control Structure, Case Structure

if-else-endif, basic loop, while loop, for loop, nested loops, labels, blockscope.

Unit V. **(7)**

Procedures: Anonymous procedure, named procedure, parameter procedure, parameter modes, default option in procedure.
Functions: Describe the uses of functions, Create stored functions, Invoke a function, and Remove a function, Differentiate between a procedure and a function, User defined function in sql expression, inbuilt Package function.
Cursors: Implicit cursors, explicit cursor, ref cursor, cursor attributes, cursor and records, cursor for loops, for update, where current of clause, cursor with sub queries.
Packages, Triggers, Exception Handling

**Reference Books:**

1. Oracle Supplied Material.
2. Bayross, Ivan, *SQL, PL/SQL, Programming language oracle*, BPB publications.

# Practical

Duration: 30 hours

## Section A
## SQL

1. Selecting all data from different tables, Describing structure of tables
2. Performing Arithmetic calculation and specifying column names, Selecting data and changing the order of rows displayed.
3. Retrieving rows by using where clause, Sorting rows by using order by clause .
4. Creating queries that require the use of numeric, character and date function, Using Concatenation with function, Writing Case-insensitive queries to test usefulness of character function
5. Performing calculation of year and months..
6. Join tables using an equi-join, Performing outer and self join, Adding condition to joins.
7. Writing queries that has group functions, Group by rows to achieve more than one result, excluding group by using having clause.
8. Creating subqueries to query values based on unknown criteria, Using subqueries to find out which values exists in one set data and not in other.
9. Controlling Transaction.
10. Adding Constraint to existing tables, Adding more columns to table.
11. Displaying information in data dictionary view, Creating simple view, complex view and with check option constraints, Attempting to modify data in view, displaying view definitions, and removing view.
12. Creating sequence and using sequence, creating non-unique indexes, dropping indexes.
13. Granting other user privilege to your tables, Modifying another user's table through the privileges granted to you.
14. Creating synonyms.
15. Creating database links.

**Section B**
**PLSQL**

16. Creating objects types, using new data types clobs and blobs, Creating table with lob data types as columns, Using dbms_lob packages to populate and interact with lob data types.
17. Declaring variable of % row type and %type.
18. Determine validity of declaration.
19. Declaring simple plsql block and executing simple plsql block.
20. Reviewing scoping and nesting blocks, Developing and testing plsql blocks, Use the dml statements in plsql blocks.
21. Performing condition actions using if statements, Performing iterative steps using the loop structure.
22. Declare Index by tables, Processing index by tables.
23. Declaring and processing plsql records.
24. Declaring cursor, using cursor for loop, applying cursor attributes, Declaring and using explicit cursors with parameters, using for update cursor.
25. Handling named exceptions, creating and using user defined expression.
26. Creating stored procedure, handling exception in procedure, compiling and invoking procedure.
27. Creating stored function, invoking stored function from a sql statement, invoking stored function from procedure.
28. Creating Packages, invoking package program units.
29. Using overloaded subprograms, Creating a one time only procedure.
30. Creating Statement and Row Triggers, Creating trigger to add the capabilities of oracle database.

# MCA501 Certificate Course on J2EE

## Theory

***Number of credits 2*** ***Duration: 30 hours***

Pre-requisite

Core Java knowledge – be able to define basic OO concepts and terminologies and code simple Java applications.
Knowledge of database – be able to write simple queries.

**Unit I** **(5)**

Introduction to J2EE
Multitiered Component Models
Overview of the J2EE Family of APIs
J2EE Containers, Services, and Communications
J2EE Deployment

JDBC
JDBC Basics and Driver Types
Prepared and Callable Statements
Metadata Classes
SQL and Java Data Types

**Unit II** **(6)**

Servlets
Architecture and Concepts Basic Servlet Concepts and Examples
Web Container and Servlet lifecycle
Request-Response Architecture
Mapping and Running Servlets
Servlet Resources – Servlet Context and Scope, HTTP GET and POST, Multithreading Issues, Error handling
Servlet Persistence and Session Tracking – Persistence in a Stateless Architecture, Introduction to Cookies, Sessions with Cookies, Session Tracking API

**Unit III** **(6)**

Java Server Pages
Architecture and Concepts JSP Concepts and Motivation
JSP Lifecycle
JSP Tags and Constructs
Implicit JSP Objects and Scopes
Custom Tag libs
JSP - Servlet Communication – Communication based on JavaBeans, Forwarding Requests and Responses

**Unit IV** **(6)**

EJBs: Architecture and Concepts
- Enterprise Java Beans
- EJB Architecture
- EJB Components
- Session and Entity Beans

**Unit V** **(7)**

Java & XML
- Understanding XML and the Java XML APIs
- Serial Access with the Simple API for XML (SAX)
- XML and the Document Object Model (DOM)
- Using XSLT

**Reference Books:**

1. Mukhar Kevin and Weaver L James, *Beginning J2EE 1.4*, Wrox Press Ltd.
2. Koch Loney, *Oracle 9i – The Complete Reference*, Oracle Press.
3. Bergster Hans, *Java Server Pages*, O'Reilly and Associates Inc.
4. Valesky Tom, *Enterprise JavaBeans*, Pearson Education Asia.
5. McLaughlin Brett, *Java and XML*, O'Reilly and Associates Inc.
6. Hunter Jason, Crawford William, *Java Servlet Programming*, O'Reilly and Associates Inc.

**Practical**

Duration 30 hrs

Students have to carry out a mini project based on any one of the following.

A web based application – Airline Reservation System, On line Banking System, etc.
Developing web components
Developing ejb components
Deploying J2EE applications

**Certificate Course on**

# MCA502 Information Storage and Management

***Total teaching Hours/Semester: 60*** ***No of Lecture Hours/Week: 04***

**Unit: 1 Introduction to Storage Technology (12)**

Data proliferation and the varying value of data with time & usage, sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations

**Unit: 2 Storage Systems Architecture (12)**

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structurecomponents, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems withstorage, Storage system connectivity protocols

**Unit: 3 Introduction to Networked Storage (12)**

JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principales, standards, & network management principales, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (iSCSI, FCIP, iFCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

**Unit: 4 Introductions to Information Availability (12)**

Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques

Managing & Monitoring

Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and proactive management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview

**Unit 5 Securing Storage and Storage Virtualization (12)**

Define storage security. , List the critical security attributes for information systems, describe the elements of a shared storage model and security extensions, Define storage security domains, List and analyze the common threats in each domain, Identify different virtualization technologies, describe block-level and file level virtualization technologies and processes.

**Reference Books:**

1. EMC students guide
2. Marc Farley Osborne, "Building Storage Networks", Tata Mcgraw Hill
3. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill
4. Storage Area Network Fundamentals , Meeta Gupta, Pearson Education Limited
5. Information Storage & Retrieval Systems Theory & Implementation, Gerald J Kowalski / Mark T Maybury, BS Publications
6. Disaster Recovery & Business Continuity - Thejendra BS, Shroff Publishers & Distributors
7. Blade Servers & Virtualization - Barb Goldworm / Anne Skamarock, Wiley India Pvt.Ltd