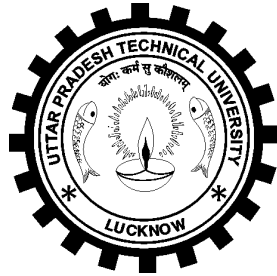


# U.P. TECHNICAL UNIVERSITY LUCKNOW



## Syllabus

[Effective from the Session : 2008-09]

## MASTER OF COMPUTER APPLICATIONS 1<sup>st</sup> Year (I and II Semester)

# U P TECHNICAL UNIVERSITY, LUCKNOW

## STUDY AND EVALUATION SCHEME

### MCA ( Master of Computer Applications)

(Effective from session 2008-09)

#### YEAR-I SEMESTER-I

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	SUBJET TOTAL	
			L	T	P	CT	TA	Total			
1	MCA-111	Professional Communication	3	1	0	30	20	50	100	150	
2	MCA-112	Accounting and Financial Management	3	1	0	30	20	50	100	150	
3	MCA-113	Computer Concepts and Programming in C	3	1	0	30	20	50	100	150	
4	MCA-114	Discrete Mathematics	3	1	0	30	20	50	100	150	
5	MCA-115	Organizational Behaviour	3	1	0	30	20	50	100	150	
<b>PRACTICALS</b>											
6	MCA-151	Programming Lab	0	0	3	30	20	50	50	100	
7	MCA-152	Language Lab	0	0	3	30	20	50	50	100	
8	GP-101	General Proficiency	0	0	0	-	-	50	-	50	
<b>TOTAL</b>			15	5	6					1000	

#### YEAR-I SEMESTER-II

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					
						SESSIONAL EXAM			ESE	SUBJET TOTAL	
			L	T	P	CT	TA	Total			
1	MCA-211	Environmental Science and Ethics	3	1	0	30	20	50	100	150	
2	MCA-212	Computer Based Numerical & Statistical Techniques	3	1	0	30	20	50	100	150	
3	MCA-213	Data Structures using C	3	1	0	30	20	50	100	150	
4	MCA-214	Principles of Management	3	1	0	30	20	50	100	150	
5	MCA-215	Computer Organization	3	1	0	30	20	50	100	150	
<b>PRACTICALS</b>											
6	MCA-251	Data Structures Lab	0	0	3	30	20	50	50	100	
7	MCA-252	Computer Based Numerical and Statistical Techniques Lab	0	0	3	30	20	50	50	100	
8	GP-201	General Proficiency	0	0	0	-	-	50	-	50	
<b>TOTAL</b>			15	5	6					1000	

**Unit -1 Basics of Technical Communication**

Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication.

**Unit - II Constituents of Technical Written Communication**

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods -Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.

**Unit - III Forms of Technical Communication**

Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order, Claim and Adjustment Letters; Job application and Resumes.

Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc.

Reports: Types; Significance; Structure, Style & Writing of Reports.

Technical Proposal; Parts; Types; Writing of Proposal; Significance.

Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing.

**Unit - IV Presentation Strategies**

Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time- Dimension.

**Unit - V Value- Based Text Readings**

Following essays form the suggested text book with emphasis on Mechanics of writing,

- (i) The Aims of Science and the Humanities by M.E. Prior
- (ii) The Language of Literature and Science by A.Huxley
- (iii) Man and Nature by J.Bronowski
- (iv) The Mother of the Sciences by A.J.Bahm
- (v) Science and Survival by Barry Commoner
- (vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (vii) The Effect of Scientific Temper on Man by Bertrand Russell.

**Text Book**

1. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, New Delhi .
2. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press 2007, New Delhi.

## **Reference Books**

1. Effective Technical Communication by Barun K. Mitra, Oxford Univ. Press, 2006, New Delhi
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., New Delhi.
3. How to Build Better Vocabulary by M.Rosen Blum, Bloomsbury Pub. London.
4. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors; Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji- Macmillan India Ltd. Delhi.
6. Manual of Practical Communication by L.U.B. Pandey & R.P. Singh; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi.

**Unit I (6 Sessions)**

**Overview:** Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards.

**Unit II (12 Sessions)**

**Mechanics of Accounting:** Double entry system of accounting, journalizing of transactions; preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill.

**Unit III (12 Sessions)**

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

**Unit IV (10 Sessions)**

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

**SUGGESTED READINGS**

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

**UNIT 1:**

Introduction to any Operating System [Unix, Linux, Windows], Programming Environment, Write and Execute the first program, Introduction to the Digital Computer; Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic, Number Systems and conversion methods

**UNIT 2:**

Standard I/O in “C”, **Fundamental Data Types and Storage Classes:** Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, **Operators and Expressions:** Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,

**UNIT 3:**

**Conditional Program Execution:** Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, **Program Loops and Iteration:** Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, **Modular Programming:** Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.

**UNIT 4:**

**Arrays:** Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, **Structures:** Purpose and usage of structures, declaring structures, assigning of structures, **Pointers to Objects:** Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, Dynamic memory allocation, defining and using stacks and linked lists.

**UNIT 5:**

Sequential search, Sorting arrays, Strings, Text files, **The Standard C Preprocessor:** Defining and calling macros, utilizing conditional compilation, passing values to the compiler, **The Standard C Library:** Input/Output : fopen, fread, etc, string handling functions, Math functions : log, sin, alike Other Standard C functions.

**Lecture-wise Break-UP**

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting
Week-1	Introduction to any OS, Programming Environment	A Simple C program	Need of Datastructures & Algorithms	Get familiar with OS and Environment.
Week-2	An Example, Termination, Correctness	Different Types of Programming Languages	Number Systems	Get familiar with C compiler Implement and Test Small Routine in C
Week-3	Number Systems	Standard I/O in C	Data Types and Variables	Implement and Test Small Routine in C

Week-4	Data Types and Variable	Data Types and Variable	Operators & Expression	Evaluation of Expression
Week-5	Operators & Expression	Operators & Expression	Operators & Expression	Evaluation of Expression
Week-6	IF, SWITCH Statements	IF, SWITCH Statements	Nested If Statement	Iteration
Week-7	Repetition structure in C	Repetition structure in C	Modular Programming	Iteration, Function
Week-8	Modular Programming	Modular Programming	Arrays	Recursion, Function
Week-9	Arrays	Structures	Structures	Arrays, Structures
Week-10	Pointers	Pointers	Pointers	Linked Lists
Week-11	Searching	Selection	Sorting	Searching, Selection
Week-12	Sorting	Strings	Strings	Sorting, Strings
Week-13	Files	Files	Std C Preprocessor	Files
Week-14	Std C Library	Std C Library	Std C Library	Use of Std. C Library

**Text Books :**

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.

**Unit-I:**

**Set Theory:** Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets

**Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation, partial ordering relation.

**Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.

**Notion of Proof:** Proof by counter-example, the contra-positive, proof by contradiction, inductive proofs.

**Unit-II:**

**Algebraic Structures:** Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

**Unit-III:**

**Posets, Hasse Diagram and Lattices:** Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices.

**Boolean Algebra:** Basic definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic gates and Karnaugh maps.

**Graphs:** Simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.

**Tree:** Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

**Unit-IV:**

**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

**Unit-V:**

**Combinatorics:** Basic Counting Technique, Pigeon-hole Principle, Recurrence Relation, Generating function, Polya's Counting Theorem

**Text books and Supplementary reading:**

1. Discrete Mathematics and Its Applications, By Kenneth H Rosen, McGraw Hill, Sept.2002.
2. Discrete Mathematical Structures with Applications to Computer Science, By J. P. Tremblay, R. Manohar, McGraw Hill Pub, 1975.
3. Graph Theory With Applications to Engineering and Computer Science, By Prentice Hall, Englewood Cliffs, N. J, 1974
4. Combinatorics: Theory and Applications, By V. Krishnamurthy, East-West Press Pvt. Ltd., New Delhi, 1986.

**UNIT I (8 Sessions)**

Concept, Nature, Characteristics, Conceptual Foundations and Importance, Models of Organizational Behaviour, Management Challenge, A Paradigm Shift, Relationship with Other Fields, Organisational Behaviour: Cognitive Framework, Behaviouristic Framework and Social Cognitive Framework.

**UNIT II (10 Sessions)**

Perception and Attribution: Concept, Nature, Process, Importance. Management and Behavioural Applications of Perception.

Attitude: Concept, Process and Importance, Attitude Measurement. Attitudes and Workforce Diversity.

Personality: Concept, Nature, Types and Theories of Personality Shaping, Personality Attitude and Job Satisfaction.

Learning: Concept and Theories of Learning.

**UNIT III (10 Sessions)**

Motivation: Concepts and Their Application, Principles, Theories, Employee Recognition, Involvement, Motivating a Diverse Workforce.

Leadership: Concept, Function, Style and Theories of Leadership-Trait, Behavioural and Situational Theories.

Analysis of Interpersonal Relationship, Group Dynamics: Definition, Stages of Group Development, Group Cohesiveness, Formal and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups.

**UNIT IV (12 Sessions)**

Organisational Power and Politics: Concept, Sources of Power, Distinction Between Power, Authority and Influence, Approaches to Power, Political Implications of Power: Dysfunctional Uses of Power.

Knowledge Management & Emotional Intelligence in Contemporary Business Organisation

Organisational Change : Concept, Nature, Resistance to change, Managing resistance to change, Implementing Change, Kurt Lewin Theory of Change.

Conflict: Concept, Sources, Types, Functionality and Dysfunctionality of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organisational, Resolution of Conflict, Meaning and Types of Grievance and Process of Grievance Handling.

Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress.

Organisational Culture : Concept, Charactersitics, Elements of Culture, Implications of Organisation culture, Process of Organisational Culture.

**Suggested Reading:**

1. Newstrom John W. - Organizational Behaviour: Human Behaviour at Work (Tata Mc Graw Hill, 12<sup>th</sup> Edition)
2. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill)
3. Mc Shane L. Steven, Glinow Mary Ann Von & Sharma Radha R. - Organizational Behaviour (Tata Mc Graw Hill, 3<sup>rd</sup> Edition)
4. Robbins Stephen P. - Organizational Behaviour (Pearson Education, 12<sup>th</sup> Edition)
5. Hersey Paul, Blanchard, Kenneth H and Johnson Dewey E. - Management of Organizational Behavior: Leading Human Resources (Pearson Education, 8<sup>th</sup> Edition)
6. Greenberg Jerald and Baron Robert A. - Behavior In Organisations: Understanding and Managing the Human Side of Work (Prentice Hall of India)
7. Davis, Keith - Human Behaviour at Works – Tata Mc Graw Hill, New Delhi.
8. Pareek, Uday - Behavioural Process in Organization (Oxford 4 IBH, New Delhi).

## MCA-151 : PROGRAMMING LAB

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Suggested Assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Linked lists
10. Data structures

It is suggested that some problems related to continuous domain problems in engineering and their numerical solutions are given as laboratory assignments. It may be noted that some of basic numerical methods are taught in the Mathematics course.

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

**LIST OF PRACTICALS**

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

**Reference Books**

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.



**MCA-212: COMPUTER BASED NUMERICAL AND  
STATISTICAL TECHNIQUES**

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3 1 0**

**Unit-I**

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

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

**Unit-II**

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

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

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

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

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

Approximation of function by Taylor's series and Chebyshev polynomial

**Unit-III**

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

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

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

**Unit-IV**

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

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

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

**Unit-V**

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

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

Application to medicine, agriculture etc.

**References:**

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

### Unit -I

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

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

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

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

### Unit - II

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

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

### Unit - III

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

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

## **Unit - IV**

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

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

## **Unit - V**

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

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

## **References**

### **Text Books**

1. Y. Langsam, M. Augenstein and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002.
2. Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.

### **Reference Books**

1. S. Lipschutz, Data Structures Mc-Graw Hill International Editions, 1986.
2. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions, 2nd edition 1984.
3. A. Michael Berman, Data structures via C++, Oxford University Press, 2002.
4. M. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 2002, 2nd edition.

**UNIT I (8 Sessions)**

Management: Concept, Nature, Importance; Management : Art and Science, Management As a Profession, Management Vs. Administration, Management Skills, Levels of Management, Characteristics of Quality Managers.

Evolution of Management: Early contributions, Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Hawthorne Experiments and Human Relations, Social System Approach, Decision Theory Approach.

Business Ethics and Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.

**UNIT II (10 Sessions)**

Introduction to Functions of Management

Planning: Nature, Scope, Objectives and Significance of Planning, Types of Planning, Process of Planning, Barriers to Effective Planning, Planning Premises and Forecasting, Key to Planning, Decision Making.

Organizing: Concept, Organisation Theories, Forms of Organisational Structure, Combining Jobs: Departmentation, Span of Control, Delegation of Authority, Authority & Responsibility, Organisational Design.

**UNIT III (10 Sessions)**

Staffing: Concept, System Approach, Manpower Planning, Job Design, Recruitment & Selection, Training & Development, Performance Appraisal

Directing: Concept, Direction and Supervision

Motivation: Concept, Motivation and Performance, Theories Of Motivation, Approaches for Improving Motivation, Pay and Job Performance, Quality of Work Life, Morale Building.

**UNIT IV (12 Sessions)**

Leadership: The Core of Leadership: Influence, Functions of Leaders, Leadership Style, Leadership Development.

Communication: Communication Process, Importance of Communication, Communication Channels, Barriers to Communication.

Controlling: Concept, Types of Control, Methods: Pre-control: Concurrent Control: Post-control, An Integrated Control System, The Quality Concept Factors affecting Quality, Developing a Quality Control System, Total Quality Control, Pre-control of Inputs, Concurrent Control of Operations. Post Control of Outputs.

Change and Development: Model for Managing Change, Forces for Change, Need for Change, Alternative Change Techniques, New Trends in Organisational Change.

**Suggested Reading:**

1. Stoner, Freeman & Gilbert Jr - Management (Prentice Hall of India, 6<sup>th</sup> Edition)
2. Koontz - Principles of Management (Tata Mc Graw Hill, 1st Edition 2008)
3. Robbins & Coulter - Management (Prentice Hall of India, 8<sup>th</sup> Edition)
4. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential Concepts and Applications (Pearson Education, 5<sup>th</sup> Edition)
5. Hillier Frederick S. and Hillier Mark S. - Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets (Tata Mc Graw Hill, 2<sup>nd</sup> Edition 2008)
6. Wehrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective (Mc Graw Hill, 12<sup>th</sup> Edition 2008)

### ***Unit-I***

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

### **Unit-II**

#### **Control Design:**

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

### **Unit-III**

#### **Processor Design:**

Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

### **Unit -IV**

#### **Input-Output Organization:**

I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

### **Unit-V**

#### **Memory Organization:**

Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 2<sup>1/2</sup>D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

### ***Text Book***

1. Computer System Architecture, M. Mano(PHI)

### ***Reference Books***

1. Computer Organization, Vravice, Zaky & Hamacher (TMH Publication)
2. Structured Computer Organization, Tannenbaum(PHI)
3. Computer Organization, Stallings(PHI)
4. Computer Organization, John P.Hayes (McGraw Hill)

Write Program in C or C++ for following:

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

**MCA-252 : COMPUTER BASED NUMERICAL AND  
STATISTICAL TECHNIQUES LAB**

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Write programs in C

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

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

# MCA 211 : Environmental Science & Ethics

## Unit-I :

Knowing our environment, socio-economic, political & environmental situations of India, Population, The land, Forest & wild life, energy sources, Toxic Chemicals & Toxicity, Hazardous waste, sustainability and Human Development.

## Unit-II

Ecology, Principles of Energy and Matter in the environment, Food Chain, Carbon and Nitrogen cycles, Biodiversity, benefits and what threatens it, Causes of extinction of the species and their remediation.

## Unit-III

Perspectives of global environmental issues, the green house effect, sources of carbon emissions, chlorofluorocarbons, their major uses and combined effect of green house gases, stratosphere, Ozone depletion and impacts.

## Unit-IV

Environmental Pollution; causes, pollutants their effect and control of pollution – (i) Air (ii) Water (iii) Soil (iv) Noise (v) Thermal (vi) Marine, the legislation of air & water pollution, solid and/ hazardous waste disposal.

## Unit-V

Social issues and environment, the western perspective, Environmental ethics, conservation of natural resources, Effectiveness of various religions in environmental conservation, technological progress and quality of life, harmony between materialism and spiritualism, imbibing human values in environmental studies, NGOs and their role in environmental preservations.

## Text Books

1. Environmental Studies – Benny Joseph – Tata McgrawHill-2005
2. Environmental Studies – Dr. D.L. Manjunath, Pearson Education-2006.
3. Environmental studies – R. Rajagopalan – Oxford Publication - 2005.
4. Text book of Environmental Science & Technology – M. Anji Reddy – BS Publication.

## References Books :

1. Principles of Environmental Science, Curnningham. W.P. & Cunningham M.A., Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. India's Environmental Policies, Programmes & Stewardship by Prof. O.P. Dwivedi, Macmilan Press Ltd., London.
3. Textbook of Environment & Ecology by Deeksha Dave and S.S. Katewa, Cengage Learning India Pvt. Ltd., Patparganj, Delhi, 2009.
4. Principles of Environmental Science and Engineering – P. Venugoplan Rao, Prentice Hall of India.
5. Environmental Science & Engineering – Meenakshi, Prentice Hall India.

# U.P. TECHNICAL UNIVERSITY LUCKNOW



Syllabus

**2<sup>nd</sup> year [III & IV Sem.]**

**[Effective from the session : 2009-10]**

**MASTER OF COMPUTER APPLICATION**

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**STUDY AND EVALUATION SCHEME**  
**MCA (Master of Computer Application)**  
**(Effective from the session: 2009-10)**

**MCA**

**YEAR II, SEMESTER –III**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
			L	T	P	SESSIONAL EXAM			ESE	Subject Total
						CT	TA	Total		
1.	MCA-311	Operating Systems	3	1	0	30	20	50	100	150
2.	MCA-312	Design & Analysis of Algorithms	3	1	0	30	20	50	100	150
3.	MCA-313	Data base Management System	3	1	0	30	20	50	100	150
4.	MCA-314	Internet & Java Programming	3	1	0	30	20	50	100	150
5.	MCA-315	Computer Based Optimization Techniques	3	1	0	30	20	50	100	150
<b>PARCTICALS</b>										
6.	MCA-351	DBMS Lab	0	0	3	30	20	50	50	100
7.	MCA-352	Java Programming Lab	0	0	3	30	20	50	50	100
8.	GP-301	General Proficiency	0	0	0	-	-	50	-	50
<b>Total</b>			<b>15</b>	<b>5</b>	<b>6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1000</b>

**YEAR – II, SEMESTER – IV**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
			L	T	P	SESSIONAL EXAM			ESE	Subject Total
						CT	TA	Total		
1	MCA-411	Management Information Systems	3	1	0	30	20	50	100	150
2	MCA-412	Object Oriented Systems	3	1	0	30	20	50	100	150
3	<b>Elective-I</b>		3	1	0	30	20	50	100	150
4	MCA-413	Fundamentals of E-Commerce	3	1	0	30	20	50	100	150
5	MCA-414	Computer Networks	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	MCA-451	Object Oriented Systems Lab	0	0	3	30	20	50	50	100
7	MCA-452	Mini Project	0	0	3	30	20	50	50	100
8	GP-401	General Proficiency	0	0	0	-	-	50	-	50
<b>Total</b>			<b>15</b>	<b>5</b>	<b>6</b>					<b>1000</b>

<b>Code</b>	<b>List of Elective-I</b>
MCAE11	Compiler Design
MCAE12	Client Server Computing
MCAE13	Data Warehousing & Mining
MCAE14	Cryptography & Network Security
MCAE15	Theory of Automata & Formal Languages
MCAE16	Distributed system

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
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**MCA (Master of Computer Application)**  
**(Effective from the session: 2010-11)**

**MCA**

**YEAR III, SEMESTER – V**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
			L	T	P	SESSIONAL EXAM			ESE	Subject Total
						CT	TA	Total		
1.	MCA-511	WEB Technology	3	1	0	30	20	50	100	150
2.	Elective-II		3	1	0	30	20	50	100	150
3.	MCA-512	Dot Net Framework & C#	3	1	0	30	20	50	100	150
4.	MCA-513	Software Engineering	3	1	0	30	20	50	100	150
5.	Elective-III		3	1	0	30	20	50	100	150
<b>PARCTICALS</b>										
6.	MCA-551	WEB Technology Lab	0	0	3	30	20	50	50	100
7.	MCA-552	Dot Net Lab	0	0	3	30	20	50	50	100
8.	GP-501	General Proficiency	0	0	0	-	-	50	-	50
		<b>Total</b>	<b>15</b>	<b>5</b>	<b>6</b>					<b>1000</b>

**List**

MCAE21	Computer Graphics & Animation
MCAE22	Simulation & Modelling
MCAE23	Advance Database Management Systems
MCAE24	Artificial Intelligence
MCAE25	Information Security & Cyber Laws
MCAE26	Information Storage & Management

**Elective-II**

**List**

MCAE31	ERP Systems
MCAE32	Software Project Management
MCAE33	Real Time Systems
MCAE34	Mobile Computing
MCAE35	Neural Networks
MCAE36	Pattern Recognition

**Elective-III**

**YEAR –III, SEMESTER – VI**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
			L	T	P	SESSIONAL EXAM			ESE	Subject Total
						CT	TA	Total		
1	MCA-611	Colloquim	0	0	3	-	200	200	-	200
2	MCA-612	Project	0	0	4	-	300	300	500	800
<b>Total</b>									<b>1000</b>	

# OPERATING SYSTEMS

MCA 311

L T P  
3 1 0

## Unit-I

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

## Unit-II

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

## Unit-III

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

## Unit-IV

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

## Unit-V

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

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

## References

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Fifth Edition, Addison-Wesley
2. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.
3. Harvey M Deital, "Operating Systems", Addison Wesley
4. Richard Peterson, "Linux: The Complete Reference", Osborne McGraw-Hill.

# DESIGN AND ANALYSIS OF ALGORITHMS

MCA 312

L T P  
3 1 0

## Unit-I

**Introduction:** Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods.

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

Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics

## Unit-II

**Advanced Data Structure:** Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, Dictionaries and priority Queues, mergeable heaps, concatenable queues

## Unit-III

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

## Unit-IV

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

## Unit-V

**Randomized Algorithms,** String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms

## References

1. Design and Analysis of Computer Algorithms, Aho, Pearson Education Pub.

2. Fundamentals of Computer Algorithms by Horowitz and Sahani, Galgotia
3. Introduction to Algorithms by Thomas H Cormen Leiserson et al, PHI
4. Computer Algorithms : Introduction to Design and Analysis by Sara Baase and Allen Van Gelder, Pearson Education
5. Algorithm Design by Jon Kleinberg and Eva Tardos, Pearson Education
6. Fundamental of Algorithms by Brassard Bratley, PHI
7. Algorithms Design by M T Goodrich et al, John Wiley
8. The Design and analysis of Algorithms by A V Aho et al, Pearson Education

## DATABASE MANAGEMENT SYSTEMS

MCA 313

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

### Unit- I

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

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

### Unit- II

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

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

PL/SQL, Triggers and clusters.

### Unit- III

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

### Unit- IV

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

### Unit- V

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

### References

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

## INTERNET & JAVA PROGRAMMING

MCA 314

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

### Unit-1

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

### Unit- II

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

### Unit-III

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

**JDBC:** The connectivity Model, JDBC/ODBC Bridge, (5) java.sql package, connectivity to remote database, navigating

through multiple rows retrieved from a database.

#### Unit-IV

**Java Beans:** Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB), **Introduction to RMI (Remote Method Invocation):** A simple client-server application using RMI.

#### Unit-V

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

#### References:

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

## COMPUTER BASED OPTIMIZATION TECHNIQUES MCA 315

L T P  
3 1 0

#### Unit I

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

#### Unit II

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

#### Unit III

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

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

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

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

#### Unit IV

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

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

#### Unit V

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

#### References:

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

## DBMS LAB MCA - 351

L T P  
0 0 3

The programme to be implemented using SQL

1. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.

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

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

## **Java Programming Lab** **MCA-352**

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

1. Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.
2. Write programs to create packages and multiple threads in Java.
3. Write programs in Java for event handling Mouse and Keyboard events.
4. Using Layout Manager create different applications.
5. Write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.
6. Using Java create Applets.
7. Use Java Language for Client Server Interaction with stream socket connections.
8. Write a program in java to read data from disk file.

## **MANAGEMENT INFORMATION SYSTEMS** **MCA 411**

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

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

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

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

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

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

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

### **Text Books**

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

### **References**

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

**Unit – I**

**Object Modeling:** Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

**Unit – II**

**Dynamic Modeling:** Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

**Unit – III**

**Functional Modeling:** Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

**Unit – IV**

**Java Programming:** Introduction, Operator, Data types, Variables, Methods & Classes, Multithread Programming, I/O, Java Applet.

**Java Library:** String Handling, Input/Output exploring Java.io, Networking, Applets classes, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and Menus, Images, Additional packages.

**Unit – V****Software Development using Java:**

Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

**Text Books:**

1. James Rumbaugh et al, "Object Oriented Modeling and Design", PHI
2. Herbert Schildt, "The Complete Reference: Java", TMH.
3. E. Balagurusamy, "Programming in JAVA", TMH.

**References:**

1. Booch Grady, "Object Oriented Analysis & Design with application 3/e", Pearson Education, New Delhi.
2. Bjarne Stroustrup, "C++ Programming Language", Addison Wesley
3. E. Balagurusamy, "Object Oriented Programming with C++", TMH

## FOUNDATIONALS OF E-COMMERCE

### MCA 413

L T P  
3 1 0

**Unit 1**

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

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

**Unit II**

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

**Unit III**

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

**Unit IV**

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

**Unit V**

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

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

### References

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

## MCA-414 : COMPUTER NETWORKS

L	T	P
3	1	0

### Unit-I

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

### Unit-II

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

### Unit-III

**Network Layer:** Point-to Point networks, concept of virtual circuit and LAN, routing algorithms, congestion control algorithms, internetworking, TCP/IP protocol, IP addresses, IPv6.

### Unit-IV

**Transport Layer:** Design issues, connection management, Internet Transport Protocol (UDP), Ethernet transport Protocol, Transmission Control Protocol. (TCP)

### Unit-V

**Application Layer:** Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls), Authentication protocols such as authentication based on shared key (Diffie Helleman Key exchanger), Introduction to multimedia and compression Techniques.

### References

1. Computer Networks by A. S Tanenbaum, 4<sup>th</sup>, Edition", Pearson education
2. Data and Computer Communication by W. Stallings, Macmillan Press
3. Computer Networks & Internet with Internet Applications by Comer Pearson Education
4. Internetworking with TCP/IP by PHI
5. Data Communication and Networking by Forouzan TMH
6. Computer Networks with Internet Protocols by W Stallings, Pearson Education
7. Local and Metropolitan Area Networks by W Stallings, VIth edition, Pearson Education

## MCA-451 : OBJECT ORIENTED SYSTEMS LAB

L	T	P
0	0	3

Experiments based on the course Object Oriented Systems to be done on C++/JAVA/UML/VISIO etc.

## MCA - E11 : COMPILER DESIGN

L	T	P
3	1	0

### Unit-1

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

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

**Lexical Analysis:** The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical

Analyzer Generator: LEX, Capabilities of Lexical Analyzer

#### Unit-II

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

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

Syntax Analyzer Generator: YACC

#### Unit-III

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

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

#### Unit-IV

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

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

#### Unit-V

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

#### References:

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

## MCA-E12 : CLIENT SERVER COMPUTING

L	T	P
3	1	0

#### Unit I

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

#### Unit II

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

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

#### Unit III

**Client/Server Network:** connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client-Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

#### Unit IV

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

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

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

#### Unit V

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

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

#### References:

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

## MCA-E13 : DATA WAREHOUSING & MINING

L	T	P
3	1	0

### Unit – I

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

### Unit – II

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

### Unit – III

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

### Unit – IV

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

### Unit – V

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

### References:

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

## MCA-E14 : CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P
3	1	0

### Unit-I

**Introduction to Cryptography:** Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, And Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.

### Unit-II

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

### Unit-III

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

### Unit-IV

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

### Unit-V

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

### Text Book:

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

### Reference Books:

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

## **MCA-E15 : THEORY OF AUTOMATA AND FORMAL LANGUAGES**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>1</b>	<b>0</b>

### **Unit – I**

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

### **Unit – II**

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

### **Unit – III**

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs,

### **Unit – IV**

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

### **Unit – V**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

### **Text Books and References:**

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

## **MCA-E16 : DISTRIBUTED SYSTEM**

### **Unit-1**

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

### **Unit-2**

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

### **Unit-3**

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

### **Unit-4**

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

### **Unit-5**

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

### **References:**

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

**G. B. Technical University, Lucknow**

**SYLLABUS**

**Master of Computer Application**

**Third Year**  
*( Semester V and VI )*

**Effective from session 2010-11**

# MCA

## Study and Evaluation Scheme

*Effective from session 2010-11*

### Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	MCA-511	Web Technology	3-1-0	30	20	50	100	150
2		MCA-Elective-II	3-1-0	30	20	50	100	150
3	MCA-512	Dot Net Framework & C#	3-1-0	30	20	50	100	150
4	MCA-513	Software Engineering	3-1-0	30	20	50	100	150
5		MCA-Elective-III	3-1-0	30	20	50	100	150
<b>Practicals / Training /Projects</b>								
6	MCA-551	Web Technology Lab*	0-0-3	30	20	50	50	100
7	MCA-552	Dot NET Lab*	0-0-3	30	20	50	50	100
8	GP-501	General Proficiency	-	-	-	-	-	50

### Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				C T	TA	Total		
1	MCA-611	Colloquium	0-0-2	-	200	200	-	200
2	MCA-612	Project	0-0-24	-	300	300	500	800

\* At least 10 problems are to be considered based on corresponding theory course.

## List of Electives for MCA

### MCA-Elective-II

MCA E21	Computer Graphics and Animation
MCAE22	Simulation and Modeling
MCA E23	Advanced Database Management Systems
MCA E24	Artificial Intelligence
MCAE25	Information Security and Cyber Laws
MCAE26	Information Storage & Management

### MCA-Elective-III

MCA E31	ERP Systems
MCA E32	Software Project Management
MCA E33	Real Time System
MCA E34	Mobile Computing
MCA E35	Neural Networks
MCA E36	Pattern Recognition

# **SYLLABUS**

## **( Master of Computer Application)**

### **MCA 511: Web Technology**

#### **Unit I: Introduction:**

Introduction to web, protocols governing the web, web development strategies, Web applications, web project, web team.

#### **Unit II: Web Page Designing:**

HTML: list, table, images, frames, forms, CSS;  
XML: DTD, XML schemes, presenting and using XML

#### **Unit III: Scripting:**

Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script

#### **Unit IV: Server Site Programming:**

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Application: data base action , development of java beans in JSP, introduction to COM/DCOM.

#### **Unit V: PHP (Hypertext Preprocessor):**

Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

#### **References**

1. Xavier, C, “ Web Technology and Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Ramesh Bangia, “Internet and Web Design” , New Age International
4. Bhave, “Programming with Java”, Pearson Education
5. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
6. Deitel, “Java for programmers”, Pearson Education

### **MCA 512: Dot Net Framework and C#**

#### **Unit-1**

**The .Net framework:** Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

## **Unit-II**

**C -Sharp Language (C#):** Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

## **Unit-III**

**C# Using Libraries:** Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

## **Unit-IV**

**Advanced Features Using C#:** Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

## **Unit-V**

**.Net Assemblies and Attribute:** .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

### **References**

1. Wiley, "Beginning Visual C# 2008", Wrox
2. Fergal Grimes, "Microsoft .Net for Programmers". (SPI)
3. Balagurusamy, "Programming with C#", (TMH)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, "C# with .Net Frame Work" , Firewall Media.

## **MCA 513: Software Engineering**

### **Unit-I: Introduction**

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

### **Unit-II: Software Requirement Specifications (SRS)**

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

### **Unit-III: Software Design**

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

#### **Unit-IV: Software Testing**

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

#### **Unit-V: Software Maintenance and Software Project Management**

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

#### ***References:***

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

# **Syllabus of Elective Subjects** **( Master of Computer Application)**

## **MCA E21 Computer Graphics and Animation**

### **Unit – I**

**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

### **Unit – II**

**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

**Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

### **Unit – III**

**Three Dimensional:** 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

### **Unit – IV**

**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, B-spline and Bezier curves and surfaces.

**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

### **Unit – V**

**Computer Animations :** Conventional and computer assisted animation, design of animation sequences, interpolation, simple animation effects, animation languages ( Key Frame System, Parameterized systems), motion specifications, methods of controlling animation.

### **References:**

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, TMH
3. Donald Hearn and M Pauline Baker, “ Computer Graphics with OpenGL”, Pearson education
4. Steven Harrington, “Computer Graphics: A Programming Approach”, PHI or TMH
5. James D Foley, A V Dam, S K Feiner and John f Hughes, “Computer Graphics Principles and Practice” Second Edition in C.

## MCA E22      Simulation and Modeling

### **Unit-1**

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

### **Unit-II**

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

### **Unit-III**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

### **Unit-IV**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams  
Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

### **Unit-V**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration , resource allocation and consideration.  
Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

### **References**

1. Geoffrey Gordon, “ System Simulation”, PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education
3. V P Singh, “System Modeling and simulation”, New Age International.
4. Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”, TMH

## **MCA E23 Advanced Database Management Systems**

### **UNIT-I**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

### **UNIT –II**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

### **UNIT III**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

### **UNIT –IV**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

### **UNIT V**

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

### ***References***

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

## **MCA E24 Artificial Intelligence**

### **Unit-I**

***Introduction*** : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

### **Unit-II**

***Introduction to Search*** : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

### **Unit-III**

**Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

### **Unit-IV**

**Machine Learning :** Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

### **Unit-V**

**Pattern Recognition :** Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

### **References:**

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India

## **MCA E25 Information Security and Cyber Laws**

### **UNIT-I**

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services,

Information System Threats and attacks, Classification of Threats and Assessing Damages

Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Concepts in Internet and World Wide Web: Brief review of Internet Protocols-TCP/IP, IPV4, IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques

### **UNIT-II**

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

### **UNIT-III**

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls,

Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

Framework for Information Security, ISO 27001, SEE-CMM, Security Metrics, Information Security Vs Privacy

### **UNIT-IV**

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection

Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

### **UNIT-V**

Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management

Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.

#### ***References :***

1. Godbole, "Information Systems Security", Willey
2. Merkov, Breithaupt, "Information Security", Pearson Education
3. Yadav, "Foundations of Information Technology", New Age, Delhi
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill
5. Sood, "Cyber Laws Simplified", Mc Graw Hill
6. Furnell, "Computer Insecurity", Springer
7. IT Act 2000

## **MCA E26 Information Storage & Management**

### **Unit-I: Introduction to Storage Technology**

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-II: Storage Systems Architecture**

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, 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 with storage, Storage system connectivity protocols.

### **Unit-III: Introduction to Networked Storage**

JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), 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-IV: Introduction to Information Availability**

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

### **Unit-V: 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 pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

### **References**

1. Information Storage and Management Storing, Managing, and Protecting Digital Information , by EMC, Hopkinton and Massachusetts, Wiley, ISBN: 9788126521470

## **MCA E31 ERP Systems**

### **UNIT - I**

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

## **UNIT - II**

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

## **UNIT - III**

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

## **UNIT - IV**

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

## **UNIT - V**

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

Using ERP tool: either SAP or ORACLE format to case study

### ***References:***

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill
2. Rahul V. Altekar “Enterprisewide Resource Planning”, Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology
5. Mary Summer, “Enterprise Resource Planning”- Pearson Education

## **MCA E32      Software Project Management**

### **UNIT-I: Introduction and Software Project Planning**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

### **UNIT-II: Project Organization and Scheduling**

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

### **UNIT-III: Project Monitoring and Control**

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

### **UNIT-IV: Software Quality Assurance and Testing**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

### **UNIT-V: Project Management and Project Management Tools**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

### ***References:***

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

## **MCA E33      Real Time System**

### **UNIT-I: Introduction**

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

### **UNIT-II: Real Time Scheduling**

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

### **UNIT-III: Resources Sharing**

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

### **UNIT-IV: Real Time Communication**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

### **UNIT-V: Real Time Operating Systems and Databases**

Features of RTOS, Time Services, UNIX as RTOS, POSIX  
Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

#### ***References:***

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

## **MCA E34     Mobile Computing**

### **Unit – I**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

### **Unit - II**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

### **Unit – III**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

### **Unit - IV**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

## **Unit – V**

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

### **References:**

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley.
4. Upadhyaya, “Mobile Computing”, Springer

## **MCA E35      Neural Networks**

### **Unit-I:**

Neurocomputing and Neuroscience

Historical notes, human Brain, neuron Mode I, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

### **Unit-II:**

Data processing

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and benchmark problems in NN.

### **Unit-III**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

### **Unit-IV**

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

### **Unit-V**

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

### **References:**

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

## **MCA E36      Pattern Recognition**

### **Unit-I**

**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

### **Unit-II**

**Statistical Pattern Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

### **Unit – III**

**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

### **Unit - IV**

**Nonparametric Techniques:** Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

### **Unit - V**

**Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

### **References:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2<sup>nd</sup> Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4<sup>th</sup> Edition, Academic Press, 2009.

## **MCA 611 Colloquium**

### **Guidelines & General Instruction:**

The aim of the subject is to develop ability of a student to carryout literature survey & independent study of an advanced subject/topic/matters in the field of Computer Science and Information technology.

At the beginning of semester a list of colloquium topic should be displayed on the notice board by the department and/or on the institution web site. Every Student must select a topic of his choice. The student is required to conduct rigorous study/survey on the subject under the supervision of the faculty member of the department, prepare a report and present this in presence of all the students of his class at the end of semester. The comments & criticism of the topic/subject will be discussed for the benefit of all the students. The evaluation will be carried out by the department based on the presentation.

## **MCA 612 Project**

### **Guidelines & General Instruction:**

Every student is required to carry out project work under the supervision of a faculty member of the department. However, a student may also opt to pursue his project work in a reputed industry/institution with the consent of Department/Institute. In such cases, the department must look into the suitability of the projects and assign one internal guide/supervisor. The internal supervisor shall monitor progress of the student continuously.

A candidate is required to present the progress of the project work ( at least twice) during the semester at an appropriate time decided by the Department . There will a final presentation of the project work at the end of the semester.