Paper Code & Title: **MCA-101-Digital Electronics & Computer Fundamentals**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	Number systems: Binary number system, Octal & Hexa-decimal number system, Conversion of Number System, Complements: r's and (r-1)'s complement, Signed Binary numbers, Binary codes, Arithmetic operations on Binary numbers. Logic Gates: AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates. Universal building blocks, Boolean algebra: Law's, Postulates and theorems, logic diagrams, Sum of Product & Product of Sum, Minimization techniques: K -Map,	**14**
II	Combinational circuits: Adders, Sub tractors, Binary parallel adders, Decimal adder, Code conversion, Multiplexers, De-multiplexers, Decoders & Encoders. Flip-flops: Types of Flip Flop: R-S, D, J-K, T, Master Slave, Registers and Counters: Shift Registers, Types of registers, Universal Shift Register with Parallel load, Bi-directional Shift register.	**14**
III	Digital computers, Components of computer, Input / Output devices, Memory, Introduction to software, Operating System (different types of OS), Programming Languages, Introduction to computer networks & Internet.	**14**

Reference Books:

1. Moris Mano, Digital Logic and Computer Design, Prentice Hal of India.
2. Moris Mano, Digital Design, Prentice Hal of India.
3. R.K. Gaur, Digital Electronics and Microcomputer, Dhanpat Rai Publication.
4. R.P. Jain, Modern Digital Electronics, Tata McGraw-Hill.
5. Malvino & Leach, Digital Principles and Applications, Tata McGraw-Hill.
6. Rajaraman & Radhakrishanan, An introduction to Digital Computer Design, Prentice Hall of India.

Paper Code & Title: **MCA-102-Accounting and Financial Management**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Overview:* Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards. Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of Final accounts, Trading Account, Manufacturing Accounts, and Profit & Loss Account, Profit & Loss.	**14**
II	Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill. 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.	**14**
III	*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.	**14**

Reference Books:

1. Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
2. Mukherjee - Financial Accounting for Management (TMH, 1st Edition).
3. Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
4. Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
5. Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
6. Ghosh T.P- Financial Accounting for Managers (Taxman, 3rd Edition)
7. Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).

Paper Code & Title: **MCA-103- Programming in C**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	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. 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,	**14**
II	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 s Global variables, separate compilation, and linkage, building your own modules.	**14**
III	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. 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, sine, like Other Standard C functions.	**14**

Reference 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.

Paper Code & Title: **MCA-104- Discrete Mathematics**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
I	**Relations:** Cartesian products, Reflexive, Symmetric Anti symmetric, Transitive Equivalence relation, partial ordering relations, composition of relations, matrix representation of relations. Function: Definition, one to one, into, many one and onto function, invertible function, composition of functions, recursion, recursive functions factorial and Ackermann function, Fibonacci sequence. **Logical and Prepositional Calculus** Compound proposition, conjunction, disjunction, truth tables, tautologics and contradictions, logical equivalence, conditional and biconditional statements, arguments, universal quantifiers, existential quantifiers, negation of quantified statements.	**14**
II	**Algebraic Structure** Binary Operation, Semigroups, Monoid, homomorphism, isomorphism of semigroups, Group, sub groups, abelian group, cosets, normal subgroups, homomorphisms, isomorphism, permutation groups. Coding theory, cryptology, coding of binary information and error detection, hamming distance, properties of hamming distance, Group codes, decoding.	**14**
III	Finite graphs, multi graph, subgraph, isomorphic and homomorphic graphs, paths, connectivity, distance, diameter, weighted graph, complete graph, regular graph, bipartite graph, union of graphs, connectedness. Matrix and linked representation of graphs, walks, paths and circuits, Hasse diagrams lattices, Euler's Hamilton paths and circuits, precedence graphs, tree graphs, minimum spanning trees, directed graphs, breadth-first search,depth-first search algorithm.	**14**

Reference Books:

1. Chowdhary, K. R. " Fundamentals of discrete Mathematical Structures', Second Edition, PHI Learning
2. Liptschutz, Seymour, "Discrete Mathematics", TMH
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", TMH.

Text Book:

1. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH.

Paper Code & Title: **MCA-105-Computer Based Numerical and Statistical Techniques**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
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.	**14**
II	*Finite differences and Interpolation:* Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Sterling's, Bessel's,. Lagrange's Interpolation, *Numerical Differentiation and Integration:* Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule.	**14**
III	*Simultaneous Linear Equations:* Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Jacobi and Gauss Seidel iterative methods, Rate of Convergence. *Solution of differential equations:* Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector methods. Curve fitting, Approximations and Regression Analysis: Method of least squares, fitting of straight lines, polynomials, exponential curves etc. Approximation of functions by Chebyshev polynomials. Linear, Non-linear and Multiple regressions. Statistical methods (mean and standard deviation): Sample distributions , Test of Significance: applications of Chi-Square Test, t and F test.	**14**

Reference Books:

1. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
2. Gupta S.P. and Kapoor, V.K., Fundamentals of Applied statistics, Sultan Chand & Sons.
3. Gupta S.P. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

Text Books:

1. Rajaraman V., "Computer Oriented Numerical Methods", PHI.

Paper Code & Title: **MCA-201-Object Oriented Programming Using C++**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Introduction:* Introducing Object – Oriented Approach, Relating to other paradigms (Functional, Data decomposition). *Basic concepts:* Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete, operators. *Generic function:* Template function, function name overloading, overriding inheritance methods, Run time polymorphism, Multiple Inheritance.	**14**
II	*Classes and Objects:* Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass / abstract classes.	**14**
III	*Inheritance and Polymorphism:* Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs. classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric Polymorphism. *Files and Exception Handling:* Streams and files, Namespaces, Exception handling, Generic Classes	**14**

Reference Books:

1. A. R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997.
2. S.B. Lippman & J. Lajoie, " C++ Primer", 3rd Edition, Addison Wesley, 2000.The C programming Lang., Person Ecl – Dennis Ritchie
3. R. Lafore, "Object Oriented Programming using C++", Galgotia Publications, 2004.
4. E. Balagurusamy, "Object Oriented Programming with C++", TMH
5. Herbert Sehlidt, "The Complete Reference c++", TMH.
6. Schaum's Outline, Programming with C++, TMH.

Paper Code & Title: **MCA-202-Computer Based Optimization Techniques**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
I	*Linear Programming Problem*: Mathematical formulation of L.P.P., Graphical method for solving LPP with two variables, Simplex method, Application of simplex method for maximization & minimization of LPP, Artificial variable technique for finding the initial basic feasible solution, Two Phase method, The Big-M method, Degeneracy in simplex method, Duality theory in LP, Dual simplex method.	**14**
II	*Transportation, Assignment & Replacement Problems*: *Transportation:* North-West Corner Rule, Lowest Cost Entry method, Vogel's Approximation method, Modi Method, Assignment problem. Replacement : Replacement of equipment/ Asset that Deteriorates Gradually, Replacement of equipment that fails suddenly, Recruitment & Promotion problem, Equipment renewal problem. *Inventory Models*: Introduction to the inventory problem, Deterministic models, The classical EOQ (Economic order quantity) model, Purchasing model with no shortage, Manufacturing model with no shortage, Purchasing model with shortage, Manufacturing model with shortage, Inventory models with probabilistic demand.	**14**
III	*Sequencing & Queuing Theory*: Sequencing problem, Johnson's algorithm for processing N-jobs through two-machine problem, N-jobs through 3 machine problem, 2- jobs through N-machine by graphical method, Characteristics of queuing system-steady state M/M/1, M/M/1K & M/M/C queuing models. *Network Analysis*: Introduction, Network & basic components, Logical sequencing, Rules of Network Construction, CPM/PERT Techniques, Critical path method (CPM),Determination of critical path (Labeling method), The Project Evaluation & Review Technique (PERT), Probability Considerations in PERT, Distinction between PERT & CPM, Project cost, Time-cost Optimization algorithm.	**14**

Reference Books:

1. Gillett B.E., Introduction to Operation Research- A Computer Oriented Algorithmic Approach, McGraw Hill.
2. Kanti Swarup, Gupta P.K., Man Mohan, Operations Research, Sultan Chand & Sons.
3. Vohra N.D., Quantitative Techniques in Managemental, T.M.H., 1990.
4. Zoints. S., Linear & Integer Programming, Prentice Hall, 1975.
5. R.K.Gupta, Operational Research, Krishna Prakashan, Mandir Meerut.
6. Hamdy a. Taha, Operation Research : An Introduction – 8rd, Prentice Hall of India.

Paper Code & Title: **MCA-203-Computer Organization and Architecture**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
I	Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (Addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.	**14**
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, Micro program sequencing, Wide-Branch addressing, Microinstruction with Next address field, Pre-fetching Microinstruction).	**14**
III	*Processor Design:* Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer. *Input-Output Organization:* I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication. *Memory Organization:* Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 21/2D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware	**14**

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)

Text Book:

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

Paper Code & Title: **MCA-204-Operating Systems**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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.	**14**
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. *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.	**14**
III	*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, Thrasing, 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. *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, Intercrosses communication, Network structure, security	**14**

Reference Books:

1. Abraham Siberschatz and Peter Baer Galvin, “Operating System Concepts”, Fifth Edition, Addision-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

Paper Code & Title: **MCA-205-Data Structures Using 'C'**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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, and 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.	**14**
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.	**14**
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. *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. *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.	**14**

Reference Books:

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

Paper Code & Title: **MCA-301-DataBase Management System (DBMS)**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
I	*Introduction:* Characteristics of database approach, data models, database users, database schema, DBMS architecture and data independence, DBMS structure. *E-R Modeling:* Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization. *EER and ER to relational mapping:* Data base design using EER to relational language.	**14**
II	*File Organization:* Indexed sequential access files; implementation using B & B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance. *Relational Data Model:* Relational model concepts, relational constraints, relational algebra *SQL:* SQL queries, programming using SQL.	**14**
III	*Database Normalization:* Functional Dependencies, Normal form up to 3rd normal form. *Concurrency Control:* Transaction processing, locking techniques and associated, database recovery, security and authorization. Recovery Techniques, Database Security	**14**

Reference Books:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 4th Edition, McGraw Hill, 1997.
2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
3. A.K. Majumdar, P. Bhattacharya, "Database Management Systems", TMH, 1996.
4. Bipin Desai, "An Introduction to database systems", Galgotia Publications, 1991

Paper Code & Title: **MCA-302-Computer Graphics & Animation**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	Computer Graphics: definition, classification & Applications, Development of Hardware & Software for Computer Graphics. Display devices, Hard copy devices. Interactive Input devices, display processor, Line drawing; various algorithms and their comparison, circle generation- Bresenham's mid-point circle Drawing algorithm, midpoint ellipse drawing algorithm. Attributes of output primitives, line style, color and intensity, Area filling algorithms, Scan line algorithm, Boundary fill flood fill algorithm, Anti-aliasing techniques.	**14**
II	Two dimensional transformations; translation, Scaling, rotation, reflection sheering, composite transformation, transformation commands, character generation. Viewing coordinates, Window, view port, clipping, Window to view port transformation, line clipping, Algorithm; Cohen Sutherland, polygon clipping; Sutherland hodgman algorithm, 3D clipping: Normalized view volumes, view port clipping, clipping in homogeneous coordinates. Illumination model: Light sources, diffuse reflection specular reflection, reflected light, intensity levels, Surface shading; phong shading ground shading, color models like RGB, YIQ, CMY, HSV etc.	**14**
III	3-D Viewing: Three-dimensional concepts, 3D display techniques, 3D representation polygon & curved surfaces, Design of curves & surfaces- Bezier's Method, B-spline methods, 3D transformation transition, Scaling, composite transformation rotation about arbitrary axis, projections: Parallel & Perspective, Hidden surface and line removal; back face removal, depth buffer and scan line methods. Introduction to multimedia, multimedia components, multimedia hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia tools, presentations tools, Authoring tools, presentations.	**14**

Reference Books:

1. D. Hearn and M.P. Baker "Computer Graphics" (2nd Ed), PHI.
2. S. Harrington – "Computer Graphics - a Programming approach" (2nd Ed) McGrawhill.
3. New Mann & Sprovl- "Principles of interactive computer graphics" (2nd Ed) McGrawhill.
4. Roger S. David "Procedural Elements for Computer Graphics", McGraw Hill.
5. Roger S David "Mathematical Elements for Computer Graphics", McGraw Hill.
6. Foley & Vandan "Computer Graphics Principles & Practice in "C" "Addision Wesly.
7. Tay Vaugham " Multimedia Making it Work" 5th Ed. 2001, Tata McGraw Hill.
8. Prabhat K. Andleigh & Kiran Thakur "Multimedia System Design", PHI
9. Drew, "Fundamentals of Multimedia", Pearsons.
10. Nigel Chapman, J. Chapman "Digital Multimedia" Wiley India.

Paper Code & Title: **MC-303-Design and Analysis of Algorithms**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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	**14**
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. *Advanced Design and Analysis Techniques:* Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis	**14**
III	*Graph Algorithms:* Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, and Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem. Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms	**14**

Reference Books:

1. Thomas H Cormen Leiserson "Introduction to Algorithms", PHI Learning Private Limited, Delhi India.
2. Sara Baase and Allen Van Gelder ,Computer Algoritms : "Introduction to Design and Analysis", Pearson Education
3. Jon Kleinberg and Eva Tardos "Algorithm Design", Pearson Education
4. Brassard Bratley "Fundamental of Algorithms", PHI Learning Private Limited, Delhi India.
5. M T Goodrich "Algorithms Design", John Wiley
6. Aho, "Design and Analysis of Computer Algorithms", Pearson Education.
7. Horowitz and Sahani ,"Fundamentals of Computer Algorithms", Galgotia Publications Pvt Ltd Delhi India.

Paper Code & Title: **MCA-304-Theory of Computation**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Review of Mathematical Preliminaries:* Set, Relations and functions, Graphs and trees, string, alphabets and languages. Principle of induction, predicates and propositional calculus. *Theory of Automation :* Definition, description, DFA,NFA, Transition systems, 2DFA, equivalence of DFA & NDFA, Regular expressions, regular grammer, FSM with output (mealy and Moore models), Minimization of finite automata.	**14**
II	*Formal Languages :* Definition & description, Pharse structured grammars & their classification, Chomskey classification of languages, closure properties of families of language, regular grammar, regular set & their closure properties, finite automata, equivalence of FA and regular expression, equivalence of two way finite automata, equivalence of regular expressions.	**14**
III	*Context-Free grammar & PDA :* Properties unrestricted grammar & their equivalence, derivation tree simplifying CFG, unambiguifying CFG, □-productions, normal form for CFG, Pushdown automata, 2 way PDA, relation of PDA with CFG, Determinism & Non determinism in PDA & related theorems, parsing and pushdown automata. Turing Machine: Model, design, representation of TM, language accepted by TM, universal Turing Machine, determine & non-determinism in TM, TM as acceptor/generator/algorithms, multidimensional, Multitracks, multitape, two way infinite tape, multihead, Halting problems of TM. Computability: Concepts, Introduction to complexity theory, Introduction to undecidaibility, recursively. Enumerable sets, primitive recursive functions, recursive set, partial recursive sets, concepts of linear Bounded Automata, context sensitive grammars & their equivalence.	**14**

Reference Book:

1. Hopcroft & Ullman "Introduction to Automata theory, languages & Computation", Narosha Publishing house.
2. Lewish Papadimutrau "Theory of Computation", Prentice Hall of India, New Delhi.
3. Peter linz, "An Introduction to formal language and automata", Third edition, Narosa publication.
4. Marvin L. Minskay "Computation: Finite & Infinite Machines", PHI.
5. Mishra & Chander Shekhar "Theory of Computer Science (Automate, Language & Computations), PHI.

Paper Code & Title: **MCA-305-Computer Networks**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Basic Concepts:* Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks. OSI and TCP/IP Models: Layers and their functions, comparison of models. Digital Transmission: Interfaces and Modems: DTE-DCE Interface, Modems, Cable modems. *Transmission Media:* Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media.	**14**
II	*Devices:* Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internetworking, Network-Layer in the internet. *Telephony:* Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching.	**14**
III	*Data link control protocols:* Line discipline, flow control, error control, synchronous and Asynchronous protocols, character and bit oriented protocols, Link access procedures. Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP. *ISDN:* Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN. *Transport and upper layers in OSI Model:* Transport layer functions, connection management, functions of session layers, presentation layer and application layer.	**14**

Reference Books:

1. A.S.Tanenbaum, "Computer Networks"; Pearson Education Asia, 4th Ed. 2003.
2. Behrouz A.Forouzan, "Data Communication and Networking", 3rd Ed. Tata McGraw Hill, 2004.
3. William stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.

Paper Code & Title: **MCA-401-Internet & Java Programming**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*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. *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.	**14**
II	*Java Swing:* Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame. *JDBC:* The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.	**14**
III	*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. *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).	**14**

Reference Books:

1. Margaret Levine Young, "The Complete Reference Internet", Tata Mcgraw-hill Education Pvt. Ltd.
2. Thampi, "Object Oriented Programming in JAVA" Wiley Dreamtech Publication.
3. Balagurusamy E, "Programming in JAVA", Tata Mcgraw-hill Education Pvt. Ltd.
4. Dustin R. Callway, "Inside Servlets", Addison Wesley.
5. Mark Wutica, "Java Enterprise Edition", QUE.
6. Steven Holzner, "Java2 Black book", Wiley Dreamtech Publication.
7. Liang, "Introduction to Java Programming, Comprehensive Version", Pearson Education.
8. Deitel and Deitel, "Java: How to Program" PHI Learning Private Limited, Delhi India

Paper Code & Title: **MCA-402-Software Engineering**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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.	**14**
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 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.	**14**
III	*Software Testing and Maintenance:* Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, 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. Need for Maintenance, Categories of *Maintenance:* Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Project Management and Other Software Engineering methodologies: 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.	**14**

Reference Books:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
2. Jibitesh Mishra and Ashok Mohanty, Software Engineering: Pearson

Text Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
3. Pankaj Jalote, Software Engineering, Wiley

Paper Code & Title: **MCA-403- Computer Vision and Digital Image Processing**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Introduction:* The role of Computer Vision, applications, successes, research issues; its relationship to natural vision, basic image properties. Digital image representation, fundamental steps in image processing, elements of digital image processing systems digitization, Display and recording devices.	**14**
II	*Digital Image fundamentals:* A simple Image model. Sampling and quantization, Relationship between Pixel, imaging geometry, image transformation, introduction to Fourier transformation, discrete Fourier Transformation, fast Fourier transformation. *Image Enhancement:* Histogram processing, image subtraction, image averaging, smoothing filters, Sharpening filters, enhancement in frequency domain, low pass filtering, high pass filtering.	**14**
III	*Image Encoding & Segmentation:* Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary *Detection:* Local analysis, global by Hough Transform & Global by graph theoretic techniques. Image Representation and Description: Chain codes, polygonal approximation, signatures, boundary segments, boundary descriptors, regional descriptors, introduction to image understanding. Motion Tracking, Image differencing, Feature matching, optic flow.	**14**

Reference Books:

1. Gonzalez and Woods “Digital Image Processing”, Addition Wesley
2. Gonzalez and Woods “Digital Image Processing using MATLAB”, Addition Wesley
3. SchalKoff: Digital Image Processing & Computer Vision, Addition Wesley.
4. M. Sonka et.al : Image Processing and Machine Vision, Prentice Hall.
5. Ballard & Brown: Computer Vision, Prentice Hall.
6. Jain A. K. Fundamentals of Digital Image Processing, PHI
7. Boyle and Thomas, ``Computer Vision - A First Course" 2nd Edition, ISBN 0-632-028-67X, Blackwell Science 1995.
8. Low, "Introductory Computer Vision and Image Processing", McGraw-Hill 1991, ISBN 0-07-707403-3

Paper Code & Title: **MCA-404-Data Warehousing & Mining**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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.	**14**
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. Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing (OLAP). Patterns & Models. Statistics. Artificial Intelligence.	**14**
III	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. 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.	**14**

Reference Books:

1. Berson, "Data Warehousing, Data-Mining & OLAP", Tata Mcgraw-hill Education Pvt. Ltd.
2. Mallach, "Decision Support and Data Warehousing System", Tata Mcgraw-hill Education Pvt. Ltd.
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

Paper Code & Title: **MCA-405-(E-1) – Information Security and Cyber Laws**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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 . Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. 11 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.	**14**
II	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. Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature.	**14**
III	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. 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.	**14**

Reference Books:

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

Paper Code & Title: **MCA-405-(E-1) - Distributed System**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	Introduction to Distributed Data system, Distributed Database Architecture, Distributed Data base Design, Transaction processing Concurrency Control techniques, Security.	**14**
II	Types of Data Fragmentations, Fragmentation and allocation of fragments, Distribution transparency, access primitives, integrity constraints. Grouping and aggregate function, Query processing, Equivalence transformation of queries. Evaluation, parametric queries, Query optimization, Join and general queries.	**14**
III	Management of Distributed transaction and concurrency control: Distributed Data base Administration, Catalogue Management Authorization, Security and protection. Examples of distributed database systems. Cost Analysis.	**14**

Reference Books:

1. Ceri & Palgathi, "Distributed Database System", Tata Mcgraw-hill Education Pvt. Ltd.
2. Raghu Rama Krishnan and Johannes Gechrib, "Database Management Systems", Tata Mcgraw-hill Education Pvt. Ltd.
3. Date C. J, "An Introduction to Database System", Addition Wesley.
4. Korth, Silbertz, Sudarshan , "Database Concepts", Tata Mcgraw-hill Education Pvt. Ltd.
5. Elmasari , Navathe, "Fundamentals of Data Base Systems", Addition Wesley.
6. Coulouris, "Distributed Systems: Concepts and Design", Pearson Education India.

Paper Code & Title: **MCA-405-(E-1) – Compiler Design**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*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	**14**
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 *Intermediate Code Generation:* Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, and Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.	**14**
III	*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. *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.	**14**

Reference Books:

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”, PHI Learning Private Limited, Delhi India.
4. Apple, “Modern Computer Implementation in C: Basic Design”, Cambridge press.

Paper Code & Title: **MCA-405-(E-1) –Management Information System**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*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.	**14**
II	*An overview of Management Information Systems:* Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, Concept of an MIS, Structure of a Management information system. *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.	**14**
III	*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. *Managing Information Technology:* Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes, CRM, SCM.	**14**

Reference Books:

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

Text Books:

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

Paper Code & Title: **MCA-501-Cryptography & Network Security**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
I	*Foundation of Cryptography and Security:*-The OSI Security Architecture , A model for network Security ,Symmetric cipher model Substitution techniques Mathematical Tools for Cryptography: Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic. Design Principle of Block ciphers: Theory of Block Cipher Design, Feistel ciphers. Cipher Network Structures, DES and Triple DES, Strength Of DES, Modes of Operation (ECB, CBC, OFB, CFB)	**14**
II	*Block Cipher Algorithms:*-IDEA, CAST, Blowfish, Two fish, AES, Pseudo Random Numbers and stream ciphers: pseudo random sequences, Linear Congruencies Generators, Cryptographic Generators, Design of Stream Cipher, RC4, RC5. *Public Key Cryptography:-* Prime Numbers and Testing for Primality, Factoring Large Numbers, Discrete Logarithms Principles of public key Cryptosystems RSA, Key Management Diffie-Hellman, key exchange, Introduction of Elliptic curve arithmetic, Key Exchange Algorithms, Public – Key Cryptography Standards. Hashes and Message Digests: Message Authentication codes, MD5, SHA- RIPEMD, HMAC.	**14**
III	*Digital Signatures, Certificates, and Standards:-* Digital Signature Standard (DSS and DSA), Public key Infrastructure, Digital Certificates and Basics of PKCS Standards. Authentication: Kerberos V4 and V5, X.509 Authentication service. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, X.400. IP and Web Security Protocols: IPSec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS). *System Security:* Computer Virus, Firewall and Design Principles,:. Electronic Commerce Security: Electronic Payment Systems, Secure Electronic Transaction (SET), Protocols (CyberCash, iKey) Ecash (DigiCash), Smart Card Based Systems.	**14**

Reference Books:

1. Cryptography and Network Security, William Stalling, PHI.
2. Applied Cryptography: Protocols & Algorithms, Schneier & Bruce, MGH International.

Paper Code & Title: **MCA-502- Fuzzy Logic & Neural Network**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	Neural Networks Characteristics: History of Development in neural networks, Artificial neural net terminology, model of a neuron, Topology, Types of learning. Supervised, Unsupervised learning. Basic Learning laws, Hebb's rule, Delta rule, widrow and Hoff LMS learning rule, correlation learning rule instar and ouster learning rules.	**14**
II	Unsupervised Learning: Competitive learning, K-means clustering algorithm, Kohonen's feature maps. Radial Basis function neural networks- recurrent networks, Real time recurrent and learning algorithm. Introduction to Counter propagation Networks- CMAC Network, ART networks, Application of NN in pattern recognition, optimization, Control, Speech and decision making.	**14**
III	Fuzzy Logic: Basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations of Fuzzy sets, Fuzzy if-then rules, Variables inference techniques, defuzzification techniques, basic Fuzzy interference algorithm, application of fuzzy logic , Fuzzy system design implementation , useful tools supporting design.	**14**

Reference Books:

1. Berkin Riza C and Trubatch, " Fuzzy System design principles- Building Fuzzy IF-THEN rule bases", IEEE Press.
2. Yegna Narayanan, "Artificial Neural Networks". 8th Printing. PHI(2003).
3. Patterson Dan W, "Introduction to artificial Intelligence and Expert systems", 3rd Ed., PHI.
4. Simon Haykin, "Neural Networks" Pearson Education.
5. Yen and Langari, "Fuzzy Logic: Intelligence, Control and Information", Pearson Educati
6. Jacek M Zaurada, "Introduction to artificial neural Networks Jaico Publishing Home, Fouth Impression.

Paper Code & Title: **MCA-503-Web Technology**

Credits Point**: 4**

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

Unit	Contents	Contact Hours
I	*Introduction:* Introduction to web, protocols governing the web, web development strategies, Web applications, web project, web team. Web Page Designing: HTML: list, table, images, frames, forms, CSS; XML: DTD, XML schemes, presenting and using XML	**14**
II	Scripting: Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script. *PHP (Hypertext Preprocessor):* Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.	**14**
III	*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.	**14**

Reference Books:

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 Quick Start Guide", Pearson Education
6. Deitel, "Java for programmers", Pearson Education

Paper Code & Title: **MCA-504- Client Server Computing**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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. *Components of Client/Server application:* The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services.	**14**
II	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. *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.	**14**
III	*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 Disk, Remote Systems Management Security, LAN and Network Management issues. *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.	**14**

Reference Books:

1. Patrick Smith & Steave Guengerich, "Client / Server Computing", PHI Learning Private Limited, Delhi India.
2. Dawna Travis Dewire, "Client/Server Computing", Tata McGraw-Hill Education Pvt. Ltd.
3. Majumdar & Bhattacharya, "Database management System", Tata Mcgraw-hill Education Pvt. Ltd.
4. Korth, Silberchatz, Sudarshan, "Database Concepts", Tata Mcgraw-hill Education Pvt. Ltd.
5. Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesle.

Paper Code & Title: **MCA-505(E-2)-Modeling & Simulation**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	Systems: Models types, principles used in modeling, system studies, interacting subsystems and example, simulation definition, examples, steps in computer simulation, advantages and disadvantages of Simulation, simulation study, classification of simulation languages. System Simulation: Techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, numerical computing techniques for continuous and discrete models, distributed leg models, cobweb models.	**14**
II	Continuous system simulation: Continuous system models, differential equation, analog computer analog methods, digital analog simulators, CSSLS, CSMPIII language. System Dynamics: Historical background, exponential, Growth and decay models, modified exponential growth models, logistic curves and generalization of growth models, system dynamics diagrams, dynamo language. Probability concepts in simulation: Stochastic variables, discrete and continuous probability function, Continuous uniform distributed and computer generation of random numbers, uniform random number generator, non uniform continuously distributed random numbers, rejection method.	**14**
III	Discrete system simulation: Discrete events, representation of time, generation of arrival patterns, simulation of telephone system, delayed calls, simulation programming tasks, gathering statistics, discrete simulation languages. Object Oriented approach in simulation, simulation in C++, Introduction to GPSS, general description, action times, choice of paths, simulation of a manufacturing shop, facilities and storage, program control statements, priorities and parameters, numerical attributes, functions, simulation of a supermarket transfer models, GPSS model applied to any application, simulation programming techniques like entry types.	**14**

Reference Books:

1. G.Gordan “System Simulation” , 2nd Ed, 2002 PHI.
2. T.A. Payer “Introduction to Simulation”, McGraw Hill.
3. W.A. Spriet “Computer Oriented Modeling and Simulation”.
4. Narsingh Deo “System Simulation with Digital Computers”, PHI.
5. V. Rajaraman “Analog Simulation”, PHI
6. Law & Kelton “Simulation Modelling and Analysis” 3rd Ed., 2000, McGraw Hill.

Paper Code & Title: **MCA-505(E-2)-Cloud Computing and Service Oriented Architecture**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
I	*Introduction:* Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments .Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CRM and ERP ,Social networking . *Cloud Computing Architecture:* Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, And Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.	**14**
II	Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. *Virtualization:* Fundamental concepts of compute ,storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN) and Virtual SAN(VSAN) and their benefits .	**14**
III	*Cloud Security:* Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Security Architecture. Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition Cloud Federation Stack, Third Party Cloud Services. *Case study:* Google App Engine, Microsoft Azure, Hadoop, Amazon, Aneka **List of Experiments:** 1. Installation and configuration of Hadoop/Euceliptus etc. 2. Service deployment & Usage over cloud. 3. Management of cloud resources. 4. Using existing cloud characteristics & Service models. 5. Cloud Security Management. 6. Performance evaluation of services over cloud. Grading System 2013 - 14	**14**

Reference Books:

1. Buyya, Selvi ,"Mastering Cloud Computing", TMH Publications.
2. Kumar Saurabh, "Cloud Computing", Wiley Pub
3. Krutz , Vines, "Cloud Security " , Wiley Pub
4. Velte, "Cloud Computing- A Practical Approach", TMH Publications.
5. Sosinsky, "Cloud Computing" , Wiley Pub

Paper Code & Title: **MCA-505(E-2)-Mobile Computing**

Credits Point**: 4**

L	T	P
3	1	0

Unit	Contents	Contact Hours
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.	**14**
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. Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations.	**14**
III	Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment. 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.	**14**

Reference Books:

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 New York.

Paper Code & Title: **MCA-505(E-2)-Artificial Intelligence and Applications**

Credits Point**: 4**

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

Unit	**Contents**	**Contact Hours**
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. *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.	**14**
II	*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.	**14**
III	*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, *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.	**14**

Reference Books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata Mcgraw-hill Education Pvt. Ltd.
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