GULBARGA UNIVERSITY

SYLLABUS FOR
MASTER OF COMPUTER APPLICATIONS (M.C.A.)

(Revised syllabus with effect from 2006-2007 and onwards)

MASTER OF COMPUTER APPLICATIONS (M.C.A.) SYLLABUS

(With effect from the academic year 2006-2007 and onwards)

I Semester: (With effect from the academic year 2006-2007 and onwards)

M.C.A. 1.1(a): Accounting and Financial Management
M.C.A. 1.1(b): Additional Mathematics
M.C.A. 1.2: Digital Electronics and Computer Organization
M.C.A. 1.3: Numerical and Statistical Computations
M.C.A. 1.4: Discrete Mathematical Structures
M.C.A. 1.5: C and C++ Programming
M.C.A. 1.6: Programming Laboratory – I

II Semester: (With effect from the academic year 2006-2007 and onwards)

M.C.A. 2.1: Optimization Techniques
M.C.A. 2.2: Operating Systems
M.C.A. 2.3: System Software and Compiler Design
M.C.A. 2.4: Information Systems Design and COBOL
M.C.A. 2.5: Data and File Structures
M.C.A. 2.6: Programming Laboratory – II

III Semester: (With effect from the academic year 2007-2008 and onwards)

M.C.A. 3.1: Object Oriented Analysis and Design using UML
M.C.A. 3.2: Data Communications and Computer Networks
M.C.A. 3.3: Database Management System
M.C.A. 3.4: Design and Analysis of Algorithms
M.C.A. 3.5: Visual Programming
M.C.A. 3.6: Programming Laboratory – III

IV Semester: (With effect from the academic year 2007-2008 and onwards)

M.C.A. 4.1: Java Programming
M.C.A. 4.2: Internet Technology and Web Design
M.C.A. 4.3: Computer Graphics and Animation
M.C.A. 4.4: Organizational Behavior
M.C.A. 4.5: Elective-I
M.C.A. 4.6: Programming Laboratory – IV

V Semester: (With effect from the academic year 2008-2009 and onwards)

M.C.A. 5.1: Artificial Intelligence
M.C.A. 5.2: Software Engineering
M.C.A. 5.3: System Simulation
M.C.A. 5.4: .NET Technology
M.C.A. 5.5: Elective - II
M.C.A. 5.6: Programming Laboratory – V

VI Semester: (With effect from the academic year 2008-2009 and onwards)

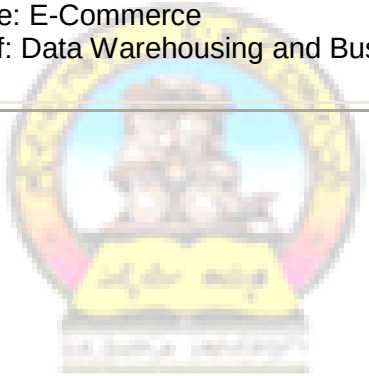
M.C.A. 6.1: Project work, Seminar and Viva-Voce

Elective – I:

M.C.A. 4.5a: Embedded Systems
M.C.A. 4.5b: Multimedia
M.C.A. 4.5c: Advanced Computer Architecture
M.C.A. 4.5d: Microprocessors and Interfacing
M.C.A. 4.5e: Pattern Recognition
M.C.A. 4.5f: Distributed Systems and Parallel Computing

Elective – II:

M.C.A. 5.5a: Neural Networks and Fuzzy Systems
M.C.A. 5.5b: Digital Image Processing
M.C.A. 5.5c: Theory of Computation
M.C.A. 5.5d: Principles of Programming Languages
M.C.A. 5.5e: E-Commerce
M.C.A. 5.5f: Data Warehousing and Business Intelligence



M.C.A. I Semester

MCA1.1(a): Accounting and Financial Management (For Mathematics students only)

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Accounting Principles- Accounting concepts-Conventions-Accounting standards-accounting records and systems-preparation of Trading, Profit and Loss Account-Balance sheet. Use of these statements by management.

Analysis of Financial Statements- Objects, nature and types of analysis- Procedure for analysis and interpretation- Ratio analysis- Analysis with fund flow and cash flow statements.

Introduction to Financial Management- Objectives, functions and scope of financial management-financial planning- formulation of financial policies- Capital structure planning- Factors influencing capital structure –capital structure theories.

Working Capital Management- Concepts, Importance and need for working capital – determinants of working capital- Methods of estimating working capital-capital budgeting- Concepts and Importance – Traditional and modern techniques of evaluating long term assets investment decisions. Cost of capital and its importance.

Marginal Costing- Variable costs-Final cost-Breakeven point-contribution-Cost volume profit analysis-Managerial uses of Marginal Costing- Standard costing- setting of standards – variance analysis.

References:

1. Khan & Jain, Financial Management, TMH (2005).
2. I.M. Pandey, Financial Management, Vikas Publishing(2005).
3. S.N.Maheshwari, Financial Accounting, Vikas Publishing (2005).
4. Nigam & Sham, Advanced Cost Accounting; Himalaya Publishing (2005).
5. S.K.Bhattacharya & John Dearden, Accounting for Management (2005).
6. M.C.Shukla, Advanced Accounts Management(2005).
7. Manmohan & Goyal, Management Accounting(2005).

MCA1.1(b): Additional Mathematics (For Commerce students only)

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Trigonometry: Complex number, De Moivre's theorem, expressions for sin x, sin ^{n}x etc. Trigonometric, exponential, logarithmic and hyperbolic functions of z = x + i y.

Matrices: Matrices and determinants, types of matrices, inverse of square matrices, linear transformation of matrices, rank of a matrix, solution of linear equations, eigen values, eigen vectors, Cayley- Hamilton theorem, quadratic forms.

Differential Calculus: Review of idea of limit, continuity and differentiation, Successive differentiation. Applications of differentiation, Rol's and mean value theorems, Indeterminate inflexion, Taylor's and Maclaurin's series, Curvature, Asymptotes, Function of Several Variables, Limit and continuity, Partial differentiation, Jacobian, Maxima and Minima (Lagranges' method of multipliers)

Integral Calculus: Integration of rational, irrational, exponential and logarithmic functions; reduction formulae, definite integrals and properties.

Differential Equations: Differential Equations: Its definition, order, degree, Formation of a differential equation, Differential Equations of 1st order, Linear Equations with constant coefficients, linear Equations with Variable coefficients.

Vectors: Definition of scalar, vector, dot product, cross product etc. Scalar and Vector point functions, Derivative of a vector, Applications: Differentiation of scalar and vector point functions, Gradient of a scalar point function, Divergence and Curl of Vector, Expression for orthogonal curvilinear co-ordinates. Line Integral, Surface Integral, Gauss Theorem, Stoke's theorem, Scalar and Vector potentials (Theorems without proof).

References:

1. S. S. Sastry, Engineering Mathematics (Vol. I & II), 3rd Edition, PHI(2004).
2. Ahsan Akhtar and Sabiha Ahsan, Text Book of Differential Calculus, PHI(2002).
3. Grewal, Engineering Mathematics, Khanna Publishers (1996).
4. Shantinarayan, Integral Calculus, S. Chand & Company (1996).
5. Deepak Chattergi, Vector Analysis, 2/e, PHI (2004).
6. Shantinarayan, Differential Calculus, S. Chand & Company(1996).

MCA1.2: Digital Electronics and Computer Organization

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Digital Electronics:

Binary Systems: Binary numbers and number base conversion, compliments, Binary Codes, Binary storage, Registers, Binary Logic and Integrated Circuits.

Boolean Algebra And Logic Gates: Axiomatic definition of Boolean Algebra, Basic theorems and properties, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates and IC Digital Logical Families.

Simplification of Boolean Functions: The Map Method **-** Maps up to four variables, Product of sums, Sum of products, Simplification, NAND and NOR implementations, Don't Care Conditions. The Tabulation Methods**-** Determination and Selection of prime implicates.

Combinational Logic: Adders, Subtractors, Code Concerters, etc, Multilevel NAND and NOR circuits, XOR and Equivalence functions, Combinational Logics.

Sequential Logic: Different Types of Flip-flops and their Triggering, Registers and Counters, Register transfer logic.

Digital Integrated Circuits: IC Terminologies-I/0 conditions, Fan-in, Fan-out, Propagation Delay, Noise immunity; Circuits and Characteristics of TTL, ECL, MOS (P-MOS), (N-MOS), CMOS, MESFET, Interfacing.

Computer Organization:

Processor Logic Design: Processor organization, Arithmetic Logic Unit, Design of Arithmetic and Logic Circuit, Design of Arithmetic Logic Unit, Status Register, Design of Shifter, Processor Unit, Design of Accumulator.

Control Logic Design: Control Organization, Hardwired Control, Micro program Control, Control of Processor Unit, PLA Control, Micro program Sequencer.

Computer Design: System of Configuration, Computer Instructions, Timing and Control, Execution of Instructions, Design of Computer Registers, Design of Control, Computer Console.

Microcomputer System Design: Microcomputer Organization, Microprocessor Organization, Instructions and Addressing Modes, Stack, Subroutines and Interrupt, memory organization, Input-Output interface, Direct memory access.

An overview of 8085 /8086 architecture.

References:

1. Morris Mano M., Digital logic and Computer Design, PHI (2001).
2. Floyd and Jain, Digital Fundamentals, 8/e, Pearson Education (2005).
3. Ronald J. Tocci, Digital Systems: Principals and Applications, 8/e, Pearson Education (2005).
4. Bartee J. C., Digital Computer Fundamentals, 6/e, TMH(2005).
5. Herbert Taub and Donald Schilling, Digital Integrated Electronics, McGraw Hill International Edition (1986).
6. Ramesh S. Gaonkar., Microprocessor Architecture, Programming, and Applications with the 8085, 4/e, Penram International Publishers(2000)

MCA1.3: Numerical and Statistical Computations

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Solutions of Non-Linear Equations : Absolute, Relative and Percentage Errors, Roots of an equation, Linear and non-Linear equations, Methods for finding roots of non-Linear equations-Bisection Method, Iterative Method, Newton-Raphson Method.

Solution of Simultaneous Linear Equations : Definitions - System of linear equations, Existence of unique roots, multiple roots and no roots, Difference between direct and iterative methods, Gauss-Elimination Method, Gauss-Seidel Method.

Interpolation and approximation: Langrange's interpolation, Polynomial interpolation, difference table, truncation error in interpolation, linear regression, polynomial fitting and other curve fitting techniques, approximation of functions by Taylor series.

Numerical Differentiation and Integration: Differentiation formulae based on polynomial fit, pitfalls in differentiation. Integration- trapezoidal and Simpson rules.

Data analysis: Raw data, classified data, frequency distribution, measures of central tendency, measures of dispersion, Correlation, Scatter diagram, Karl Person's correlation coefficients, Probable error for Correlation coefficients, regression, regression lines, regression coefficients, properties of regression coefficients, Fitting of regression lines.

Elements of Probability: Sample Space and Events, axioms of probability, conditional probability and independence. Addition, multiplication, total and Bayes' theorems.

References:

1. S. S. Sastry, Introductory Methods of Numerical Analysis, 4/e, PHI (2005).
2. C. Morris, J. Rolph, Introduction to Data Analysis and Statistical Inference, PHI (2005)..
3. Kishore. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, PHI(2005)..
4. Jain, M.K., Iyengar, S.R.S. and Jain, R.K., Numerical Methods for Scientific and Engineering Computation, Wiley Eastern.
5. Gerald Wheatley, Applied Numerical Analysis, sixth Edition, Pearson Education (2005).

6. William, Saul, William and Brian, Numerical Recipes in C, 2/e, Cambridge University Press (2005).
7. Shankar Rao K., Numerical Methods for scientists and Engineers, PHI((2005).

M.C.A.1.4 : Discrete Mathematical Structures

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Logic and Proofs: Propositions, conditional propositions and logical equivalence, quantities, methods of proof, mathematical induction.

Preliminaries: Sets, sequences, number system, relations, equivalence relations, matrices, functions.

Combinatorics: Basic principles, permutations and combinations, probability, Binomial coefficients and combinatorial identities, the Pigeonhole principle, principle of Inclusion and Exclusion, generating functions, recurrence relations.

Graphs and Trees : Graphs, paths and cycles, Euler paths and circuits, Hamiltonian paths and circuits, traveling salesman problem, shortest-path algorithm, representation of graphs, isomorphism of graphs ,planar graphs, trees- spanning trees, minimal spanning trees, binary trees, tree traversal, isomorphism of trees.

Boolean Algebra and Combinatorial Circuits: Combinatorial circuits, Boolean algebras, Boolean functions and synthesis of circuits, applications.

Languages and Finite State Machines: Languages and grammars, sequential circuits and Finite state machines, Finite state Automata, non-deterministic Finite-state Automata, relationship between languages and Automata.

Groups and Coding: Semi groups, groups, coding of binary information and Error detection, decoding and error correction.

References:

1 Discrete Mathematical Structures , Kolman ,Busby and Ros , 4/e , Pearson Education (2003).
2 Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4/e , Pearson Education (2005).
3 Purna Chandra Biswal, Discrete Mathematics and Graph Theory, PHI (2005).
4 Trembley J.P. and Manohar R., Discrete Mathematical Structure with Application to Computer Science. TMH.

MCA1.5: C and C++ Programming

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

C Programming:

Fundamentals, Operation on Data, Input and Output Statements, Control statements, Functions, Storage Classes, Arrays, Pointers, Structures and Unions, Enumeration, Command line parameters, Macros, C Preprocessors.

C++ Programming:

Object oriented programming, concepts of OOP, OOP languages, advantages of OOP, C++ program structures, data types, operators, type casting, constants, precedence of operators, I/O, control structures, functions.

Structures, classes, objects, friend functions, overloading member functions, constructors, destructors, operator overloading and type conversion, inheritance, types of inheritance, virtual base classes, abstract classes, pointers and inheritance, pointers and arrays, memory models, new and

delete operators, binding, polymorphism and virtual functions, files, generic programming with templates, exceptional handling, strings, namespace, conversion functions, array based I/O, standard template library(STL).

References:

1. B. W. Kernighan and D. M. Ritchie, C Programming Language, 2/e, PHI(2005).
2. Ashok N. Kamthane, Object Oriented Programming with ANSI C and Turbo C++, Pearson Education (2005).
3. Gottfried , Programming with ' C ', TMH, Schaum's Series(2003).
4. Herbert Schildt, C++-The Complete Reference, 2/e, TMH (2003).
5. Deitel H.M., Deitel P.J., C How To Program, 3/e, PHI(2005).
6. B. A. Forouzon, R. F. Gilberge, Computer Science: A Structured Approach Using C++, 2/e, Thomson Learning (2004).
7. Stroubstrup B., The C++ Programming Language, Addison Wesley(2004).

MCA 1.6: PROGRAMMING LABORATORY - I

Practicals: 6 hrs./week **Max. Marks: 100**
I. A. Marks: 50

This laboratory course comprises of C and C++ programming.

I. Lab. Assignment shall be carried out to include the following features of C and C++:

- Control structures, Passing of parameters to functions by value and by address, Returning values by functions, Arrays, structures and unions, Dynamic memory allocation
- Pointers, array of pointers, pointers to arrays, Passing /returning pointers to/form functions, Passing/returning/ structures to/from functions
- Bit wise operations
- Command line parameters
- Read, write, append, merge operations on files
- Classes, objects, constructors and destructors, Function overloading, Operator overloading, Friend functions, Inheritance, virtual functions, abstract classes
- Templates

II. Lab. assignments shall be carried out using C/C++ programming language based on the papers M.C.A. 1.2: Digital Electronics and Computer Organization and M.C.A. 1.3: Numerical and Statistical Computations.

M.C.A. II Semester

MCA 2.1: Optimization Techniques

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Linear Programming: Introduction, Formulation of LPP, General mathematical model of LPP, Slack and Surplus variables, canonical and standard form of LPP. Graphical method; Standard LPP and Basic solution. Fundamental Theorem of LPP. Simplex Algorithm, big-M method and revised simplex algorithm.

Concept Of Duality: Formulation of Dual LPP, Duality theorem, advantages of duality, dual simplex algorithm and sensitivity analysis.

Transportation Problem: Introduction, transportation problems-balanced and unbalanced, loops in transportation table. Methods for finding initial basic feasible solution. Tests for optimality. Unbounded transportation problems.

Assignment Problem: Mathematical form of the assignment problem, methods of solving assignment problem. Variations of the Assignment problem.

Game Theory: Introduction, 2x2 game, Solution of games, solution by linear programming, Network analysis , maximal flow problems, CPM and PERT.

Introduction to job sequencing and replacement problems.

References:

1. Hamdy A. Taha, Operations Research, 7/e, Pearson Education (2005).
2. Panneerselvam R., Operations Research, PHI (2002).
3. Gillet B.E, Introduction to Operations Research, TMH.
4. Hiller F.S. & Leibermann G.J., Operations Research, Holden day.
5. Sharma J.K, Operations Research, Theory and Applications, McMillan India Ltd.(1997).

MCA 2.2: Operating Systems

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Operating system overview, objectives and functions, evolution of operating systems, major achievements, characteristics of modern operating systems, windows 2000 overview , UNIX systems.

Processes: Process description and control, threads, SMP, microkernel's, concurrency – mutual exclusion and synchronization, deadlock-prevention, avoidance, detection.

Memory Management: Partitioning, paging, segmentation, virtual memory.

Scheduling: Uniprocessor scheduling, scheduling algorithms, multiprocessor and real time scheduling.

I/O Management : I/O devices and functions , I/O buffering , disk scheduling , RAID , disk cache, file management – file organization , directories , file sharing , record blocking, secondary storage management.

Distributed Systems: Distributed processing, Client/Server, clusters, distributed process management.

Security: Computer security, security threats, protection, intruders, malicious software, trusted systems.

Case Studies: Windows 2000, UNIX system and shell programming

References:

1 William Stallings, Operating systems, 4/e, PHI/Pearson Education (2004).
2 Gary J. Nutt, Operating Systems, 2/e, Addition-Wesley(2000)
3 Silberschartz A. and Galvin P., Operating System Concepts, 5/e, Addison Wesley (2004).
4 I. M. Flyn, A. Mclver McHoes., Understanding Operating Systems, 3/e, Thomson Learning (2001).
5 D. M. Dhamdhare, Operating Systems, Tata Mc.Graw-Hill (2004).
6 Deitel H.M., An Introduction to Operating Systems, Addison Wesley (2000).

MCA 2.3 : System Software and Compiler Design

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: System software and machine architecture, traditional (CISC) machines, RISC machines.

Assemblers: Basic assembler functions, machine dependent and machine independent assembler features, one-pass assemblers, multipass assemblers, MASM assembler, SPARC assembler.

Loaders and Linkers: Basic loader functions, machine dependent and machine independent loader features, linkage editors, dynamic linking, bootstrap loaders.

Macro Processors: Basic macro processor functions, machine dependent and machine independent macro processor features, macro processor design options.

Compilers: The compilation process, stages, phases and passes, grammars, ambiguous grammars, the parsing problem, lexical analysis-symbol recognition, lex, interface with YACC; top down parsing, bottom up parsing, semantic analysis, storage allocation and code generation.

References:

1. Leland L. Black, System Software, 3/e, Pearson Education (2005).
2. Robin Hunter, The Essence of Compilers, Pearson Education (2005).
3. A.V. Aho, R. Semi, J.D. Ullman, Compilers - Principles, techniques and tools, Pearson Education (2004).
4. D.M. Dhamdhre, Systems Programming and Operating Systems, TMH (2003).
5. Santanu Chattopadhyay, Compiler Design, PHI(2005).

MCA 2.4 : Information Systems Design and COBOL

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Systems concepts and the information system environment, the system development life cycle, the role of system analyst.

Systems Analysis: Systems planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost/benefit analysis.

System Design: The process and stages of system design, input/output and form design, file organization and database design.

System Implementation: System testing and quality assurance, implementation and software maintenance, hardware/software selection, project scheduling and software, security, disaster recover and ethics in system development.

COBOL Programming: Structure of COBOL Program, Character Set, Reserve words, Data types, data and file descriptions, COBOL verbs, Operators, I/O Statements, Control Structures, table handling and File handling, Report generation.

References:

1. Elias M. Awad, System Analysis and Design, Galgotia Publication.
2. Roy M.K. and Dastidar D.G., COBOL programming, TMH (1993).
3. Kendall and Kendall, Systems Analysis and Design, 5/e, PHI (2005).
4. Lee, "System Analysis and Design, Vol. I & II, Galgotia Publication.
5. Philippakis A.S. & Kazmier L. J., Information system Through COBOL, 2/e, McGraw Hill International.
6. James A. Senn, Analysis and Design of Information Systems, McGraw Hill (1999).
7. Rajaraman V. and Sahasrabudde, H.V., Computer Programming in COBOL, PHI(2005).

MCA 2.5: Data and File Structures

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Data Structures:

Linear Data Structures: Abstract data types, Linked list**-** Single, Circular and double linked lists, Representation of linked list in memory, operations, applications. Stacks**-** representation of stack, operations on stacks, applications. Queues**-** representation of queues, priority queues, applications.

Nonlinear Data Structures: Trees **–** Binary trees, representation of binary trees, operations on binary trees, binary search trees, binary threaded trees, heaps, AVL trees, Splay trees, B – trees. Graphs – representation of graphs, operations on graphs, shortest path algorithms, applications.

Sorting: Insertion sort, shell sort, heap sort, merge sort, quick sort, indirect sorting, bucket sorting.

File Structure:

Physical files and logical files, file processing operations, secondary storage-organization of disks and CD-ROM**;** buffer management, I/O units, fundamental file structure concepts- field and record organization, managing fixed-length, fixed-field buffers; management of records-record access, file access and file organization**;** data compression, reclaiming space in files, internal sorting and binary searching, indexing, indexing with binary search trees, multilevel indexing and B-trees, index sequential file access, hashing.

References:

1. Mark A. Weiss, Data Structures and Algorithm Analysis in C++, 2/e, Pearson Education (2005).
2. M. J. Folk, B. Zoellick and G. Riccardi, File Structures-An Object Oriented Approach, Pearson Education (2005).
3. Langsam Yedidyah, Augenstein Moshe J., Tenenbaum Aaron M., Data Structures Using C and C++, 2/e,PHI/Pearson Education(2004).
4. R. F. Gilberg and B. A. Forouzan, Data Structures-A Pseudocode Approach with C++, Thomson Learning (2001).
5. Samanta. D., Classic Data Structures, PHI (2004).
6. Trembley J. P. and Sorenson P. G., An Introduction to Data Structures with Applications, McGraw Hill.

MCA 2.6: PROGRAMMING LABORATORY -II

Practicals: 6 hrs./week **Max. Marks: 100**
I. A. Marks: 50

This laboratory course comprises of C++ and COBOL programming.

I. Lab. assignments shall be carried out to include the following features of COBOL:

- Control structures
- Table handling
- File handling
- Report generation.

II. Lab. assignments shall be carried out using C/C++ programming language based on the papers M.C.A. 2.1: Optimization Techniques, M.C.A. 2.2: Operating Systems, M.C.A.2.3: System Software and Compiler Design, M.C.A. 2.5: Data and File Structures.

M.C.A. III Semester

MCA 3.1: Object Oriented Analysis and Design Using UML

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Object Orientation, the Unified Modeling Language, architecture, software development life cycle.

Structural Modeling: Classes, relationships, common mechanisms, diagrams, class diagrams, interfaces, types and roles, packages, instances, object diagrams**.**

Behavioral Modeling: Interactions, Use Cases, Use Case Diagrams, interaction diagrams, activity diagrams, events and signals, state machines, processes and threads, time and space, state chart diagrams.

Architectural Modeling: Components, deployment, collaborations, patterns and frameworks, component diagrams, systems and models, applying the UML.

References:

1. G. Booch, J. Rambaugh and I. Jacobson, The Unified Modeling Language User Guide, Pearson Education (2005).
2. H. Erikson, M. Penker, B. Lyons, and D. Fado, UML 2 Tool Kit, Wiley Publishing (2004).
3. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Pearson Education (2004).
4. W. Richard Stevens, Using UML: Software Engineering with Objects and Components, 1/e, Pearson Education (2000).

M.C.A.3.2 : Data Communications and Computer Networks

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Data communications and Networking overview, a simple protocol architecture, OSI, TCP/IP protocol architecture.

Data Communications: Basic concepts, Analog and digital data transmission, transmission impairments, channel capacity, Guided and wireless transmission, signal encoding techniques, digital data communication techniques, data link control, frequency division multiplexing, synchronous time division multiplexing.

Wide Area Networks: Circuit switching and packet switching, routing in switched networks, congestion control, congestion control in packet switching networks, Frame relay congestion control.

Local Area Networks: Topologies and transmission media, LAN –protocol architecture, bridges, Layer2 and Layer3 switches, emergence of high speed LANS, Ethernet Token ring, Fiber channel.

Internetwork Protocols: Basic protocol functions, principles of internetworking, connectionless internetworking, Internet protocol, IPv6.

Introduction to Network Security: Security requirements and attacks, confidentiality with symmetric encryption, Message authentication and hash functions, public-key encryption and digital signatures, security socket layer and transport layer security, IPv4 and IPv6 security.

References:

1 William Stallings, Data and Computer Communications, 7/e, Pearson Education (2003).
2 William A. Shay, Understanding Communications and networks, 3/e, Thomson Learning-Vikas Pub.(2004).
3 Black Uyless, Computer Networks: Protocols, Standards, And Interfaces, 2/e, PHI.
4 Douglas E. Comer, Internetworking with TCP/IP, Vol. I**-** Principles, Protocols, And Architecture, 3/e, PHI(2004).
5 Douglas E. Comer, Internetworking With TCP/IP, Vol. II: Design, Implementation, And Internals**,** 3/E, PHI(2004).
6 Stevens W.R.,UNIX Network Programming, Vol. I and Vol II, 2/e, PHI (2005).
7 Stevens W.R. and Bill Fenner and A. M. Rudoff, UNIX Network Programming-The Sockets Network AI, Vol. I, 3/e, PHI (2005).

MCA 3.3 : Database Management Systems

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Database, characteristics of database approach, database users, advantages of database systems.

Database System Concepts and Architecture: Data models, schemas and instances, the three schema architecture, data independence, DBMS languages and interfaces, DBMS component modules and database system utilities, overview of Hierarchical, Network & Relational Data Base Management Systems, data modeling using Entity-Relationship Model.

The Relational Data Model: Relational models concepts, relational constraints and relational database schemas, update operations and dealing with constraint violations, relational algebra, relational calculus, relational database design by ER to Relational mapping..

Relational Database Manipulation- SQL: Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.

Relational Database Design: Anomalies in a database-A consequence of bad design, functional dependencies, Normal forms based on primary keys, general definitions of second and third normal forms, Boyce-Codd normal form, relational database design algorithms, multivalued dependencies and fourth normal form, join dependencies and fifth normal form, other dependencies and normal forms, database design and implementation process.

System Implementation Techniques: Database System Architecture and the System Catalog, query processing and optimization, transaction processing concepts, concurrency control techniques, database recovery techniques, database security and authorization.
Advanced Database Concepts: Concepts of object-oriented databases, object database standards, languages and design, object relational database systems, Distributed database concept, types of distributed database systems, an overview of Client-Server architecture.

References:

1. Fundamentals of Database Systems, Elmasri and Navathe, 3/e, Pearson Education (2005).
2. An Introduction to Database Systems, Bipin C. Desai, Galgotia Publications (2004).
3. An Introduction to Database Systems, Date, C. J., Sixth Edition, Addison-Wesley.
4. Kroenke David M., Database Processing Fundamentals, Design, And Implementation, 8/e, PHI.

MCA 3.4 : Design and Analysis of Algorithms

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Design Of Efficient Algorithms: Algorithms, Analysis of algorithms, Time and Space complexity, running time of a program, review of stack, queues, trees, recursion, Heaps and heap sort.

Divide and Conquer: General method, binary search, Max and Min, merge sort, quick sort.
Matrix Multiplication and related operations: Strassen's matrix multiplication, inversion of matrices, LUP Decomposition and its application, Boolean matrix multiplication.

Dynamic Programming: The General method, multistage graphs, all pairs shortest paths.

Fast Fourier Transform: Discrete Fourier transform and its inverse, FFT algorithm, FFT using bit operations, product of polynomials, Schonhage-Strassen integer multiplication algorithm.

Integer And Polynomial Arithmetic: Integer and Polynomial multiplication and division, modular arithmetic, Chinese remaindering, GCD and Euclid's algorithm. Polynomial GCDs.

Backtracking: General methods, 8 – Queens problem, Sum of subsets, Knapsack problem, NP – hard and NP – complete problems.

References:

1. Ellis, Horwitz, Sartaj Sahani and S. Rajashekaran, Computer Algorithms, Galgotia Publications Pvt. Ltd (2003).
2. Aho A.V, Hopcroft J.E and Ullman, J.D., The Design and Analysis of Computer Algorithms, Addison – Wesley (1998).
3. David Harel, Algorithmics: The Spirit of Computing, 2/e, Pearson Education (2005).
4. S. K. Basu, Design Methods and Analysis of Algorithms, PHI (2005).
5. Sara Baase, Computer Algorithms – An Introduction to Design and Analysis, Addison Wesley.

MCA 3.5: Visual Programming

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Client-Server basics, introduction to the VB Environment, Visual Basic Overview & Terminology, Event driven programming, VB Programming Environment.

Visual Basic Building Blocks and Default Controls: Forms, Using Controls, Exploring Properties, Methods And Events, Introduction To Intrinsic Controls, Working With Text, Working With Choices, Special Purpose Controls.

VB Advance Controls: Events, Menu bar, Popup Menus, Tool bar, Message Box, Input Box, Built-in Dialog Boxes, Creating MDI, Working with Menus

VB Programming Fundamentals and Variables: Introduction to Variables, Variable Declaration, Arrays, Introduction to Constants And Option Explicit Statement, Assignment Statements, Working With Math Operations, Strings, Formatting Functions.

Controlling and Managing Program : All Control Statements, Loops, Error Trapping, Working With Procedures, Functions, Controlling How Your Program Starts, Introduction to common controls- Tree view, list view, tab strip, Creating and working with control arrays.

Visual Basic and Databases: Understanding the Data Controls And Bound Controls, Introduction to Data Form Wizard, Introduce DAO, Working With Record sets, Record Pointer, Filters, Indexes, Sorts And Manipulation of Records.

Remote And ActiveX Data Objects: Working With ODBC, Remote Data Objects And Remote data Control, Introducing ADO, ADO Data Control, Using Data Grid Control And ActiveX Data Objects.

ActiveX Controls, Extending ActiveX Controls And Classes: Creating, Testing, Compiling, Enhancing And User Drawn ActiveX Controls, Using ActiveX Control Interface Wizard And Property Pages Wizard, Introducing Ambient, Extender Objects, Creating Property Pages, Building Class Modules, ActiveX DLL.

Help Writing: Building a help, System, Building & Topics File, Labeling the topics, Creating a help project, primary & secondary help window, linking to internet, Adding Multimedia, Using HTML help workshop, content sensitive help, help file.

Reports and Packaging: Data Reports and Crystal Reports, Packaging A Standard EXE Project.

References:

1. Halvorson, Microsoft® Visual Basic® 6.0 Professional Step By Step, PHI (2005).
2. B. Reselman et. al., "Using Visual Basic 6", PHI(2005).
3. E. Petroutsos, "Mastering Visual Basic 6.0", BPB.
4. E. Brierley, Anthony Prince, & David Rinaldi, "Visual Basic 6: How-to", Techmedia
5. V.K. Jain, "Introduction to OOP and VB", Vikas Publication.

MCA 3.6: PROGRAMMING LABORATORY -III

Practicals: 6 hrs./week **Max. Marks: 100**
I. A. Marks: 50

This laboratory course comprises of C++, Visual Basic and Database programming.

I. Lab. Assignment shall be carried out to include the following features of Visual Basic:
   - Forms
   - Controls, control arrays
   - Control structures
   - Databases-Data Controls, working with record sets, record pointers, filters, indexes, ODBC, ADO, ActiveX data objects, ActiveX DLL.
   - Data reports.
   - File handling

II. Lab. Assignment shall be carried out to include the following features of SQL:
   - Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.
   - Introduction to PL/SQL

III. Lab. assignments shall be carried out using C/C++/VB programming languages based on the papers M.C.A. 3.2: Data Communications and Computer Networks, M.C.A. 3.4: Design and Analysis of Algorithms.

M.C.A. IV Semester

MCA 4.1: JAVA Programming

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction to Java: History of Java, Java Design Goals & Concepts, Java Tools - Compilers, Browsers/Interpreters.

The Java Language: Introduction , Syntax , Statements , Expressions , Operators , Types , Variables , Comments , Literals , Arrays , Conditionals, Loops , Blocks.

Object Oriented Java Programming: Objects and classes, object variables, static fields and methods, method parameters, object construction, packages, documentation comments, inheritance, interfaces and inner classes.

Java GUI Programming with AWT and Swing: User Interfaces and Event Driven Programming, Layout Managers, Event Handlers, User Interaction -Mouse Events, Keyboard Events; Components – Windows, Frames, Dialog Boxes, Menus; Swing Action objects.

Java Applets: Applet basics, the applet HTML tag and attributes, multimedia, the applet context, JAR files, application packages, java web start, storage of application preferences.
Stream IO: Input Streams and Output Streams, Byte Arrays, Files, Pipes, Strings.

Exceptions and Debugging: Dealing with errors, catching exceptions, logging, using assertions, debugging techniques, the JDB debugger.
Advanced Programming: Threads, Synchronization, Scheduling, database connectivity: JDBC, introduction to Java Beans.

Networking with Java: Web Interaction, Sockets, Client/Server Programming.

References:

1. Cay S. Horstmann and Gary Cornell, Core JAVA 2, Volume-I, 7/e, Pearson Education (2005).
2. Cay S. Horstmann and Gary Cornell, Core JAVA 2, Volume-II, 7/e, Pearson Education (2005)
3. Bruce Eckel, Thinking in Java, 3/e, Prentice Hall.
4. C. Muthu, Programming with JAVA, Thomson-Vijay Nicole (2004).
5. Partrick Naughton, Herbert Schidlt, JAVA 2 -The Complete Reference, 4/e, Tata McGraw Hill(2001).

MCA 4.2: Internet Technology and Web Design

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Internet Technology:

Internet, internet protocols-basic protocol functions, principles of internetworking, internet protocol, IPv6. Internetwork operations- multicasting, routing protocols, integrated service architectures. Transport protocols-TCP, TCP congestion control, UDP. Internet applications, world wide web (WWW), web browsers, search engines.

Web Design:

Variables In The Web Design Environment: HTML and XML Languages, web browsers, coding for multiple screen resolutions, bandwidth concerns.

Web Site Design Principles: Design for the medium, design the whole website, design for the user, design for the screen, Planning the Site, planning site navigation, creating page templates, web

typography- type design principles, controlling typography with the <FONT> element and Cascading Style Sheets, styling with CSS, graphics and Color, HTML frames, publishing and maintaining your websites.

JAVA Script: The JAVA Script programming language, creating JavaScript source file, hiding JavaScript from incompatible browsers, variables, functions, objects and events, data types and operators, decision making with control structures and statements, windows and frames, working with forms in JavaScript, using JavaScript with CSS styles, cookies and security, introduction to document object model, debugging JavaScript, server side JavaScript, database connectivity, working with Java Applets and embedded data.

Introduction to VB Script.

References:

1. William Stallings, Data and Computer Communications, 7/e, Pearson Education (2003).
2. Don Gosselin, JavaScript, Web Warrior Series,3/e, Thomson Learning(2004).
3. Douglas E. Comer, Internetworking With TCP/IP, Vol. Ii: Design, Implementation, And Internals**,** 3/E, PHI(2004).
4. Kate Kalata, Internet Programming with VBScript and JavaScript, Thomson Learning (2001).
5. Karl Barksdale, E. Turner , HTML, JavaScript, and Advanced Internet Technologies, Web Warrior Series,3/e, Thomson Learning(2006).

MCA 4.3: Computer Graphics and Animation

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: A survey of computer graphics, video display devices, Rater-Scan systems, Random Scan systems, graphics monitor and workstations, input devices, hardcopy devices, graphics software.

Output Primitives: Points and lines, algorithms to generate circle, ellipse and other curves; curve functions, pixel addressing, filled area primitives, attributes of output primitives.

Two Dimensional Transformation: Basic transformations, composite transformations, transformation between coordinate systems, clipping operations.

Three Dimensional Concepts and Transformations: Display methods, polygon surfaces, quadric surfaces, spline representations, Bezier curve and surfaces; B-Spline curves and surfaces; fractal geometry methods, three dimensional transformation, projections, clipping.

Animation Graphics: General computer animation functions, raster animation, computer animation languages, key-frame systems, motion specification.

References:

1. Donald, Hearn, and Pauline, Baker, Computer Graphics, 2/e, Pearson Education (2003).
2. Laszlo Micheal J., Computational Geometry And Computer Graphics In C++, PHI.
3. Steven, Harrington., Computer Graphics – A Programming Approach, McGraw Hill.

MCA 4.4: Organizational Behavior

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction to Organization-Concept of Organization-nature and types of organization-organizations in the Indian Context-Introduction, meaning and scope of organization behavior-historical background of O.B-O.B an behavioral Science-Contributing disciplines to O.B.

Individual behavior-Biological characteristics-Personality theories-Models of personality-personality determinants- personality traits-Perception-factors influencing perception-inter personal perception-John-Window model-Social perception.

Motivation-Basic motivational process-theories motivation- Maslow's model- Herzberg's model-Vroom's model and other models.

Group Behavior- Definition and classifying of groups- Group Structure, Group process, Cohesive groups, group dynamics- Intra group and Inter group dynamics- Conflict and collaboration. Industrial and organizational conflict-Causes, resolution and prevention of conflicts.

Leadership- Nature and functions-styles of leadership- leadership theories- Versalistic and contingency theories- issues of power and authority- Organizational Communication- effective organizational communication.

References:

1. Luthans Fred, Organizational Behavior, McGraw Hill (2005).
2. Stephen. P. Robbins, Organizational Behavior, Pearson Education/PHI (2005).
3. K.Ashwathappa, Organizational Behavior, Himalaya Bombay(2005).
4. Uday Pareek, l Behavioral Process in organization Oxford an IBH, New Delhi.
5. Dwivedi R.S, Human Relations and Organizational Behavior, Macmillan India Ltd. (2005).
6. Uma Shekharan, Organizational Behavior TMH (2005).
7. Paul Hersey and K. M. Blamhard, Management of Organization Behavior PHI (2005).

MCA 4.5: Elective-I

M.C.A. 4.5a: Embedded Systems

M.C.A. 4.5b: Multimedia

M.C.A. 4.5c: Advanced Computer Architecture

M.C.A. 4.5d: Microprocessors and Interfacing

M.C.A. 4.5e: Pattern Recognition

M.C.A. 4.5f: Distributed Computing

MCA 4.6: PROGRAMMING LABORATORY - IV

Practicals: 6 hrs./week **Max. Marks: 100**
I. A. Marks: 50

This laboratory course comprises of C/C++, JAVA programming.

I. Lab. assignments shall be carried out to include the following features of JAVA:

- Classes, objects, constructors and destructors
- Control structures
- packages
- Inheritance
- Event Handlers
- Applets
- Exceptions and debugging
- Threads, multithreading
- Database connectivity
- File handling

II. Lab. assignments shall be carried out to include the following features of Web designing:

- HTML tags, Creating page templates, CSS, graphics and Color, HTML frames, DHTML
- JavaScript control structures, functions, events, windows and frames, JavaScript frames and CSS, database connectivity

III. Lab. assignments based on the paper MCA 4.3: Computer Graphics shall be carried out using C/C++.

IV. MINI PROJECT**:** An in-house project shall be carried out in the Lab. as part of Laboratory work, in a group not exceeding three, under the guidance of course teacher. The objective of the project is to help the student develop the ability to apply theoretical and practical tools/techniques to solve real-life problems related to industry, academic institutions and research laboratories. Computer languages studied during the present and previous semesters shall be used to implement the projects.

M.C.A. V Semester

MCA 5.1: Artificial Intelligence

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Importance of AI, AI related fields, knowledge, knowledge based systems, knowledge representation, knowledge organization and knowledge manipulation.

Knowledge Representation: Formalized symbolic logic-syntax and semantics of Propositional Logic, Syntax and semantics of FOPL, properties of wffs, conversion to clausal form, inference rules, resolution principle, representation using rules. Dealing with inconsistencies and uncertainties. Structured knowledge-Associative networks, frame structures, conceptual dependencies and scripts. Object oriented representations.

Knowledge Organization and Manipulation: State space search, uninformed search, informed search, searching And-Or graphs, Production systems, knowledge organization ands management.

Natural Language Processing: Grammars and Languages, basic parsing techniques, semantic analysis and representation structures, natural language generation, natural language systems.

Expert system Architecture.

LISP: Typing, basic functions, functions, predicates and conditionals, list structure, recursion, scope of variables, input/output, macros, debugging lisp programs.

PROLOG: Facts, objects and predicates, variables, rules, input/output, fail predicate, recursion, cut predicate, arithmetic operations, compound objects, dynamic databases, string operations, file operations.

References:

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI(2004).
2. George F. Luger, Artificial Intelligence, 4/e, Pearson Education (2003).
3. Russel and Norvig, Artificial Intelligence - A Modern Approach, 2/e, PHI (2005).
4. W. L. Hennessey, Common LISP, McGraw Hill.
5. Nilsson, N.J., Principles of AI, Narosa Publishing House.

MCA 5.2: Software Engineering

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Product and Process: Evolving role of software, software characteristic and components, crisis, myths, software engineering – a layered technology, software process, linear sequential model, prototyping model, RAD model, evolutionary software process model.

Software Process and Project Metrics: Measures, metric indicators, metric in process and the project domains, software measurement, metrics for software quality, software quality assurance.

Analysis Concepts and Principles: Requirement analysis, communication techniques, analysis principles, software prototyping & Specification.

Analysis Modeling: Elements of the analysis model, data modeling, functional modeling, behavioral modeling, the mechanics of structured analysis, data dictionary, other classical analysis methods.

Design Concepts and Principles: Software Design and software Engineering design process, Design principles, Design concepts, Design methods-Data design, Architectural design and process,

Transform and Transaction mappings, Design post processing, Architectural design optimization, Interface design, Procedural design.

Software Testing Methods: Fundamentals, Test case design, White box testing, basis path testing, control structure testing, black box testing, Software testing strategies.

Object Oriented Software Engineering: Object oriented concepts, Identifying the elements of an object model, Management of object-oriented software projects, Object-oriented analysis, design and testing.

References:

1. Roger S. Pressman, Software Engineering**,** 4/e, McGraw Hill (2005).
2. I. Sommerville, Software Engineering, 6/e, Addison Wesley (2001).
3. Shooman, Software Engineering, McGraw Hill .
4. B. Bruegge and A. H. Dutoit, Object Oriented Software Engineering, 2/e, Pearson Education (2005).
5. T. C. Lethbridge and R. Laganiere, Object Oriented Software Engineering, Tat McGraw Hill (2004).
6. Rambaugh J., Bluha M., Premerlani W., Eddly Fand Lorenen W., Object-Oriented Modeling and Design, PHI(2005).
7. Ghezzi, Etal, Fundamentals of Software Engineering, PHI (2005).

MCA 5.3: System Simulation

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Definition of system and simulation, Merits and demerits of simulation, Areas of application, Types of systems, various types of models to represent them, Discrete and Continuous systems, Steps in simulation study, Simulation Examples, Concepts of system Clocks, Event scheduling Vs Time advance algorithms.

Statistical Models in Simulation: Random variables, discrete distributions- Binomial, Poisson and Geometric distributions, continuous distributions-Normal and Exponential distributions, Inverse transformation techniques, convolution method, Acceptance-Rejection technique, queuing models, random number generation, test for random numbers.

Simulation Software: Selection of simulation software, simulation in C++, Simulation in GPSS, experimentation and statistical analysis tools, trends in simulation software.

Input Modeling: Data collection, Distribution functions such as Normal, Poisson, exponential Distributions, Goodness of fit tests, Chi square test. Input models without data, multivariate and time series input models.

Verification and Validation of Models: Guidelines for verification of models, their calibration and Validation, Face validity, Validation of model assumptions, validating input-output transformations, Use of historical Data.

Evaluation of Simulation Experiments: Length of simulation run, static and dynamic stochastic simulations, elimination of transients, Auto correlated observations, variance reduction techniques.

References:

1. Jerry Banks. John S. Carson & Barry L. Nelson - Discrete Event system simulation, 3/e, Pearson Education (2005).
2. Narsingh Deo, System simulations with Digital computers, PHI (2005).

3. James A Payne Introduction to Simulation: Programming Techniques & Methods of Analysis McGraw Hill.
4. Geoffrey Gordon, System Simulation, 2/e, PHI (2005).

MCA 5.4: .NET Technology

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: What is .NET? What are C#, VB.NET and MSIL? Introduction to Visual Studio .NET, .NET SDK and Tools.

Language Fundamentals: Console IO, Comments and Documenting, Common Language Runtime, Base Class Library, Namespaces, Syntax comparison of C# and VB.NET

Type Hierarchy: Object and Basic types, References and Values, Boxing.

Language Features: Object Oriented Programming, Inheritance, Polymorphism, Garbage Collection, Iteration and Flow of Control, Arrays, Exception Handling, Interfaces.

Windows Application Development: WinForms, Event Model, Controls and Menus
.NET Framework: File Handling, Event Handling, Thread pool and synchronization.

ADO.NET: ADO.NET objects, Connections, DataAdapters, Commands, DataSets, DataViews, Binding to Controls.

Code Management: Interoperability with COM, Interoperability with other .NET modules Private and Shared Assemblies, Versioning.

ASP.NET: HTTP Paradigm and ASP.NET, What are Active Server Pages (ASP) .NET Using ASP.NET, ASP.NET Advantages , State Management , Controls , Page Layout, Error Handling, Tracing.

Web Services: Web Service Development, Creating a Web Service Client**.**

References:

1. David I. Scheinder, An Introduction To Programming Using Visual Basic .Net®, 5/e, PHI(2005).
2. Richar Leinecker, Using ASP.NET, Pearson Education (2005).
3. Keith Morneau and Jill Batistick, Active Server Pages, Thomson Learning(2003).
4. G. Andrew Duthie, Microsoft® Asp.Net Programming With Microsoft Visual Basic® .Net Version 2003 Step By Step, PHI(2005).
5. Reynolds-Haertle, OOP With Microsoft Visual Basic .Net And Microsoft Visual C# .Net-Step By Step, PHI(2005).
6. John Sharp|Jon Jagger, Microsoft® Visual C# .Net, Step By Step, PHI.
7. Andy Wigley et al., Microsoft .NET Compact Framework (Core Reference) by Microsoft Press(2003).
8. Shirish Chavan, Visual Basic.NET, Pearson education (2005).
9. Schneider, An Introduction to Programming Using Visual Basic .NET, 5/e, PHI (2005).

MCA 5.5: Elective -II

M.C.A. 5.5a: Neural Networks and Fuzzy Systems

M.C.A. 5.5b: Digital Image Processing

M.C.A. 5.5c: Theory of Computation

M.C.A. 5.5d: Principles of Programming Languages

M.C.A. 5.5e: E-Commerce

M.C.A. 5.5f: Data Warehousing and Business Intelligence

MCA 5.6: PROGRAMMING LABORATORY - V

Practicals: 6 hrs./week **Max. Marks: 100**
I. A. Marks: 50

I. Lab. assignments shall be carried out to include all the features of C#, VB.NET and ASP.NET.
II. Lab. assignments shall be carried out to include all the features of GPSS.
III. Lab. assignments shall be carried out to include all the features of PROLOG and LISP.
IV. Lab. assignments shall be carried out using PROLOG/LISP/ GPSS programming languages based on the papers M.C.A. 5.1: Artificial Intelligence, M.C.A. 5.3: System Simulation.

M.C.A. VI SEMESTER

PROJECT WORK, SEMINAR AND VIVA-VOCE: Each student has to carry out a Project work individually either in the Department or in any Institution / Industry under the supervision of an internal Guide in the Department and an external Guide in the Institution / Industry, where the project work is undertaken. Further, he/she has to submit a dissertation on the project work done, duly certified by the Guides and Head/Director of the Department/Institution, to the University for Evaluation.

ELECTIVES

MCA 4.5a: Embedded Systems

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction to embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, EPROM) Tristate devices, Buses, DMA, UART and PLD's Built-ins on the microprocessor.

Interrupts basics, ISR; Context saving, shared data problem. Atomic and critical section, Interrupt latency.

Survey of software architectures, Round Robin, Function queue scheduling architecture, Use of real time operating system. RTOS, Tasks, Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore.

Inter task communication, message queue, mailboxes and pipes, timer functions, events Interrupt routines in an RTOS environment.

Embedded system software design using an RTOS Hard realtime and soft real time system principles, Task division, need of interrupt routines, shared data.

Embedded Software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system.

Debugging techniques. Testing on host machine, Instruction set emulators, logic analysers In-circuit emulators and monitors.

References:

1. David A. Simon, An Embedded Software Primer, Pearson Education (2005).
2. Daniel W. Lewis, Fundamentals of Embedded Software Where C and Assembly Meet, Pearson Education (2005).
3. Dr. Prasas, Vikas Gupta, Das & Verma, Programming for Embedded System, WILEY Dreamtech INDIA Pvt.
4. Frank Vashid & Tony Givergis, Embedded System Design, WILEY Publ.
5. Michael Barr, Programming Embedded Systems , O'REILLY.

M.C.A. 4.5b: Multimedia

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Multimedia Authoring and Data Representations: Multimedia, hypermedia, WWW, overview of multimedia software tools, multimedia authoring, authoring tools, VRML, graphics/image data types, file formats, color fundamentals, color models in images, color models in video, video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

Multimedia Data Compression: Lossless compression algorithms- variable length coding, dictionary based coding, arithmetic coding, lossless image compression**;** Lossy compression algorithms – distortion measures, quantization, transform coding, wavelet-based coding, wavelet packets, embedded zerotree of wavelet coefficients, set partitioning in hierarchical trees**;** Image compression standards- JPEG standard, JPEG2000 standard, JPEG-LS standard, bilevel image compression standards**;** Basic Video compression techniques – video compression based on motion compensation, search for motion vectors, H.261, H.263**;** MPEG video coding; Basic audio compression techniques, MPEG audio compression.

Multimedia Communication and Retrieval: Computer and multimedia networks-Multimedia networks, multiplexing technologies, LAN, WAN, access networks, common peripheral interfaces**;** Multimedia network communications – Quality of multimedia data transmission, multimedia over IP, multimedia over ATM networks, transport of MPEG-4, multimedia on demand(MOD), multimedia over wireless networks.

References:

1. Ze-Nian Li, Mark S. Drew, Fundamentals of Multimedia, Pearson Education (2005).
2. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing Communications and Applications, Pearson Education (2004).
3. John F Koegel Bufford, Multimedia Systems, Addison Wesley Publication (1994).
4. Jeffcoate, Multimedia in Practice: Technology and Applications, PHI (2005).
5. Gokul, Multimedia Magic, BPB Publications (1996).

MCA 4.5c: Advanced Computer Architecture

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Pipe Line And Vector Processing: Introduction , Linear pipepline , Classification, Reservation tables, Introduction prefetch and branch handling, Data Buffering and Busing structure, Internal forwarding and register tagging, Hazard detection , Characteristics of Vector processing.

Array Processing : SIMD Array processors, SIMD Interconnection networks , Static and dynamic - Mesh connection, Cube connection, Barrel shifter and data manipulation, parallel algorithm for SIMD matrix multiplication.

Multiprocessor Architecture: Loosely coupled, tightly coupled multiprocessor configurations, Interconnection networks, Interleaved memory organization, Multiprocessor operating systems, Software requirements for multiprocessors.

Multiprocessing Control And Algorithms: Inter process communication mechanism and process synchronization, system deadlock problem, Multiprocessor scheduling strategy, parallel algorithms for multiprocessors.

Memory Organization: Introduction, Characteristics of memory systems, Memory hierarchy, Cache memories, Mapping schemes, Virtual memory concepts, paging and segmentation systems , placement policies.

References:

1. Kai Hwang and Feye A. Briggs, Computer Architecture and parallel processing, McGraw Hill, (1984).
2. Dezso Sima, Terence Fountain and Peter Kacsuk, Advanced Computer Architecture-A Design Space Approach, Pearson Education (2005)
3. Rafiquzzamann and Chadra, Modern Computer Architecture, West Publishing Company, USA, (1997).
4. Kai Hwang, Advanced Computer Architecture, McGraw Hill (2000).

MCA 4.5d: Microprocessors and Interfacing

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Number system, computer data formats, microprocessor and its architecture, addressing modes, data movement instructions, arithmetic and logic instructions, program control instructions, programming the microprocessor, 8086/8088 hardware specifications, memory interface, basic i/o

interface, interrupts, direct memory access and DMA-controlled i/o, bus interface, the 80186/80188/80286 microprocessors, the 80386 and 80486 microprocessors, Pentium and Pentium pro microprocessors, Pentium II, Pentium III and Pentium IV microprocessors.

References:

1. Barry B. Brey and C. R. Sharma, The Intel Microprocessors – Architecture, Programming and Interface, Pearson Education (2005).
2. Walter A Triebal , The 80386,80486 and Pentium processor, Hardware, Software and Interfacing , Prentice Hall International.
3. Mindshare. INC., Don Anderson and Tom Shanley, Pentium System Architecture, 2/e, Wesley Publishing Company.

MCA 4.5e: Pattern Recognition

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Application of Pattern Recognition, statistical Decision Theory, Image Processing and Analysis.

Probability: Introduction, Probability of Events, Random Variables, Joint Distribution and Densities, Moments of Random variables, Estimation of Parameters from samples, Minimum Risk Estimations.

Statistical Decision Making: Introduction, Baye's Theorem, Multiple Features, Conditionally Independent Features, Decision Boundaries,- Estimation of Error rates, Chacteristic centers, Estimating the Composition of Populations.

Non Parametric Decision Making: Introduction, Histograms, Kernel and Windows Estimators, Nearest Neighbour Classification Techniques, Adaptive Decision Boundaries, Adaptive Discriminant Functions, Minimum Squared.

Clustering: Introduction, Hierarchical Clustering, Partitional Clustering.

Artificial Neural Networks: Introduction, Nets without Hidden layers, Nets with Hidden layers,The Back – Propagation Algorithm, Hopfied Nets – An Application: Classifying Sex from facial images.

Processing Of Wave Form And Images: Introduction, Gray level Scaling, Transformations, Equalisations, Geometric Image Scaling and Interpolations, Logarithmic Gray Level Scaling ,The Statistical Significance of Image Features.

References:

1. Earl Gose, Richard Johnsonbaugh and Steve Jost, Pattern Recognition and Image Analysis, PHI, 1997.
2. Fu.K.S., Syntactic Methods in Pattern Recognition, Academic Press, 1974.
3. Tray Y Young and Thomas W Calvert, Classification, Estimation and Pattern Recognition, American Elservier Publication Company Inc., 1994.
4. Duda R.O. and Hart P.E., Pattern Classification and Scene Analysis, John Wiley (1973).

M.C.A. 4.5f: Distributed Systems and Parallel Computing

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Distributed Systems:

Distributed System Concepts, Communication, Distributed Models, Invocation Semantics, Remote Procedure Calls, Naming, File System, Security, Concurrency control and recovery, local area network, distributed languages and communication primitives, case studies of distributed systems.

Parallel Computing:

Parallel Machines and Computations, Potential for Parallel Computation, Vector Algorithms and Architectures, MIMD Computers or Multiprocessors, Distributed Memory Multiprocessors, Interconnection Networks, Data Dependence and Parallelism, Implementing Synchronization and Data Sharing, Parallel Processor Performance, Temporal Behavior of Parallel Programs, Parallel I/O.

References:

1. G. Couloris, Distributed System, Concept & Design, Addison Wesley.
2. Tanenbaum, Distributed Systems, PHI/Pearson Education (2005).
3. P. K. Sinha, Distributed Operating Systems, PHI(2005).
4. Michel J. Quinn, Parallel Computing: Theory and Practice, McGraw-Hill.
5. Jordan Harry and A. Gita, Fundamentals of Parallel Processing, PHI (2005).
6. Kai Hwang, Advanced Computer Architecture, McGraw-Hill.

M.C.A. 5.5a: Neural Networks and Fuzzy Systems

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Introduction to Neural networks and fuzzy logic, basic concepts of neural networks, human brain, model of artificial neuron, neural network architectures, characteristics of neural networks, learning methods.

Backpropogation Networks: Architecture, backpropogation learning, applications, tuning of backpropogation neural networks, parameters in BPN, variation of standard backpropogation algorithm, research directions.

Associative Memory: Autocorrelators, heterocorrelators, Wnag et. al.'s multiple training encoding strategy, exponential BAM, associative memory for real-coded patter pairs, applications.

Adaptive Resonance Theory: Classical ART networks, simplified ART architecture, ART1, ART2, applications.

Fuzzy Set Theory: Crisp sets, Fuzzy sets, Crisp relations, Fuzzy relations.

Fuzzy Systems: Crisp logic, predicate logic, fuzzy logic, fuzzy rule based systems, defuzzification methods, applications.

Hybrid Systems : Neuro-fuzzy hybrids, fuzzy-backpropogation networks, LR-type fuzzy numbers, fuzzy neuron, fuzzy BP architecture, learning in fuzzy BP, inference by fuzzy BP, applications, fuzzy ARTMAP, simplified ARTMAP, applications, fuzzy associative memories-single association FAM, fuzzy Hebb FAMs, FAM involving a rule base, FAM rules with multiple antecedents/consequents, applications.

References:

1. S. Rajashekaran, G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logics and Genetic Algorithms, PHI (2005).
2. Stamatios V. Kartalopoulos, Understanding Neural Networks And Fuzzy Logic—Basic Concepts And Applications, PHI (2005).
3. Bart Kosko, Neural networks and fuzzy systems - A dynamical systems approach to machine intelligence, PHI (2005).

MCA 5.5b: Digital Image Processing

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction, digital image fundamentals, image enhancement in the spatial domain, image enhancement in the frequency domain, image restoration, color image processing, wavelets and multiresolution processing, image compression, morphological image processing, image segmentation, representation and description ,object recognition .

References:

1. R.C. Gonzalez and R. E. Words, Digital Image Processing, 2/e, Pearson Education (2002).
2. Anil K .Jain, Fundamentals of Digital Image Processing, PHI (2005).
3. Chanda & Mujumder, Digital Image Processing and Analysis, PHI(2005).
4. Millan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, Thomson Learning-Vikas Publishing House (1998).
5. Arthur K. Weeks, Fundamentals of Digital Image Processing, PHI(2005).

MCA 5.5c: Theory of Computation

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Sets, relations and functions; strings and their properties; automation, transition systems, nondeterministic finite state machines, equivalence of DFA and NDFA, Mealy and Moore Models.

Formal Languages and Regular Grammars: Chomsky classification of languages, languages and their relation, operations on languages, languages and automata, regular expressions, finite automata and regular expressions, pumping lemma, regular sets and regular grammars.

Context-free languages: Context-free languages and derivation trees, ambiguity in context-free grammars, normal forms for context-free grammars, pumping lemma, decision algorithms, push down automata, pushdown automata and context-free languages, parsing and pushdown automata.

Turing Machines and Linear Bounded Automata: Turing machine model, representation of Turing machines, language acceptability, design of Turing machines, the model of linear bounded automation, Turing machines and type 0 grammars, linear bounded automata and languages, halting problem of completeness, NP-completeness.

LR(k) grammars, computability**-** primitive recursive functions, recursive functions, partial recursive functions and Turing machines.

References:

1. K.L.P. Mishra and N. Chandrasekaran, Theory of Computer Science, 2/e, PHI(2005).
2. Michael Sipser, Introduction to the Theory of Computation, Thomson Learning (2005)
3. J P Hoperoft, J D Ullman, Introduction to Automata, Languages and Computation, Narosa Publications.

M.C.A. 5.5d: Principles of Programming Languages

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction: Evolution of Programming Languages, Language Design Issues, Impact of Machine Architectures, Language Translation Issues, Modeling Language Properties, Data Types, type binding, type checking and type conversion.

Sequence Control: Sequence control within Expression, Sequence control between statements, Subprogram Sequence control (Simple, Recursive), Exception Handling, Co-routines.

Data Control: Names and Referencing Environment, Static and Dynamic scope, Block Structure. Storage Management: Run Time Elements Requiring Storage, Programmer and system controlled storage management, Fixed and variable sized elements in heap storage Management.

Introduction to Functional Programming: Functions, Recursion, Control Structures, Implementation, Introduction to concurrent programming: Concepts, Parallelism in H/W, Implicit synchronization, concurrency as interleaving.

Object Oriented Programming: Concepts, Objects, Classes, Abstraction, Data Encapsulation, Inheritance, Polymorphism.

Storage management, Distributed processing and Network programming.

References:

1. Terrence W. Pratt and Marvin V. Zelkowitz, Programming Language: Design and Implementation, 4/e, PHI (2005).
2. Ravi Sethi, Programming Language – Concepts and Constructs, Addison – Wesley.
3. Seyed H. Roosta, Foundations of Programming Languages-Design and Implementation, Thomson Learning (2003).
4. Ellis Horowitz, Fundamentals of Programming Languages, Galgotia Publication.

M.C.A. 5.5e: E-Commerce

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Electronic Commerce Framework, Electronic Commerce and media Convergence, The Anatomy of E-commerce Applications.

Market Forces Influencing the I-Way, Components of the I-Way, Network Access Equipment, Global Information Distribution Networks, public policy Issues Shaping the I-Way.

Client-Server Network Security, Emerging Client-Server Security Threats, Firewalls and Network Security, Data and Message Security, Challenge Response System, Encrypted Documents and Electronic Mail, U.S. Government Regulations and Encryption, Summary.

Architectural Framework for Electronic Commerce, World Wide Web (WWW) as the Architecture, Web Background: Hypertext publishing, Technology Behind the Web, Security and the Web, Summary.

Consumer - Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer's perspective, mercantile models from the Merchant's Perspective, Summary.

Types of Electronic Payment Systems, Digital Token – Based Electronic Payment Systems, Smart Cards and Electronic payment Systems, Credit Card-Based Electronic Payment Systems, Risk and Electronic payment Systems, Designing Electronic Payment Systems, Summary.

Electronic Data Interchange, EDI Applications in Business, EDI: Legal, Security and Privacy Issue, EDI and Electronic Commerce, Summary.

Mobile Computing Framework, Wireless Delivery Technology and Switching Methods, Mobile Information Access Devices, Mobile Data Internetworking Standards, Cellular Data Communications Protocols, Mobile Computing Applications, personal Communication Service (PCS).

References:

1. Kosiur, Understanding Electronic Commerce, PHI (2005).
2. G. Winfield Treese and Lawrence C. Stewart, Designing Systems for Internet Commerce, Pearson Education (2005).
3. Trepper, E-Commerce Strategies, PHI (2005).
4. Awad Elias M., Electronic Commerce **-** From Vision to Fulfillment, PHI (2005).

MCA 5.5f: Data Warehousing and Business Intelligence

Teaching: 4 hrs./week **Max. Marks: 100**
I. A. Marks: 50

Introduction To Data Warehousing: The need for data warehousing, Operational and informational Data stores, Data warehouse definition and characteristics, Data warehouse architecture

Data Warehousing Component: Data warehouse Database, Sourcing, Acquisition, Cleanup and transformation tools, Metadata, Access tools, Data marts, Data warehousing administration and management, Information delivery system.

Online Analytical Processing (OLAP): Need for OLAP, Multidimensional data model, OLAP guidelines, Multidimensional vrs. Muiltirelational (OLAP), Categorization of OLAP tools, OLAP tools internet

Statistics: Data counting and probability, Hypothesis testing, Contingency Tables, The chi square test, and non casual relationship.

Introduction to data mining : The motivation, Learning from past mistake, Data mining, Measuring data mining effectiveness, Embedded data mining into business process, What is decision tree, Business score card, Where to use decision tree, The general idea, How the decision tree works .
Case study: Prediction wireless communication churns with CART.

Nearest Neighbor And Clustering: Where to use clustering and nearest neighbor prediction, How clustering and nearest neighbor prediction works Case study: Image recognition for human handwriting

Genetic Algorithm: What are Genetic Algorithms, Where to use Genetic Algorithm?, The general idea, How the Genetic algorithm works
Case study: Optimizing predictive customer segment

References:

1. Rajeev Parida, Principles and Implementation of Data Ware housing, Fire Wall Media, Lakshmi Publications (2005).
2. W.H.Inmon, Building the Data Warehouse , John Wiley & Sons(2005).
3. Sam Anahory and Dennis Murray, Data Warehousing in the Real World, Pearson Education (2005).
4. Margaret H. Dunham, Data Mining-Introductory and Advanced Topics, Pearson Education (2005).
5. Amitesh Sinha, Data Warehousing, Thomson Learning (2004).
6. IBM, An Introduction to Building the Data Warehouse, PHI (2005).
7. Alex Berson & Stephon J. Smith, Data warehousing, Data mining and OLAP by, Tata McGraw Hill (2005).
8. Sam Anahory & Dennis Murray, Data Warehousing in the Real World – A Practical Guide for Building Decision Support Systems, Pearson Education (2004).

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