

# **MCA**

**Course Curriculum for**

## **Master of Computer Applications**

**Scheme and Syllabus**

**Through Distance Education  
(w.e.f. July 2004)**



**Directorate of Distance Education  
Guru Jambheshwar University of  
Science & Technology, Hisar**

**Five Year Integrated MCA Course  
for Distance Education for the  
Session 2003-2004  
Scheme**

**BCA 1st Year / MCA 1st Year**

Paper Code	Nomenclature of Paper	Max Marks		Total
		External	Internal*	
MCA-101	Computer Fundamentals	70	30	100
MCA-102	Computer Programming & Problem Solving Using C	70	30	100
MCA-103	Mathematics-I	70	30	100
MCA-104	Business Flow Systems	70	30	100
MCA-105	Operating System-I	70	30	100
MCA-106	Communication & Presentation Skills	35	15	50
MCA-107	Lab – 1 based on 101	70	30	100
MCA-108	Lab – 2 based on 102	70	30	100
Total		525	225	750

**BCA 2nd Year / MCA 2nd Year**

Paper Code	Nomenclature of Paper	Max Marks		Total
		External	Internal*	
MCA-201	Data Structure & Algorithms	70	30	100
MCA-202	Database System	70	30	100
MCA-203	Digital Electronics	70	30	100
MCA-204	Computer Organization and Architecture	70	30	100
MCA-205	Mathematics-II	70	30	100
MCA-206	Communication Skills- Scientific & Technical Writing	35	15	50
MCA-207	Lab – 1 based on 201	70	30	100
MCA-208	Lab – 2 based on 202	70	30	100
Total		525	225	750

**BCA 3rd Year / MCA 3rd Year**

Paper Code	Nomenclature of Paper	Max Marks		Total
		External	Internal*	
MCA-301	Computer Networks	70	30	100
MCA-302	Object Oriented Programming using C++	70	30	100
MCA-303	Software Engineering	70	30	100
MCA-304	Internet Fundamentals	70	30	100
MCA-305	Mathematics-III	70	30	100
MCA-306	Social Implications of IT	35	15	50
MCA-307	Lab – 1 based on 301	70	30	100
MCA-308	Minor Project Distribution of Marks Evaluation 35 Viva-Voce 35 (viva-voce will include Presentation/Seminar/ Demonstration)	70	30	100
Total		525	225	750

**BCA 4th Year / MCA 4th Year**

Paper Code	Nomenclature of Paper	Max Marks		Total
		External	Internal*	
MCA-401	Computer Graphics & Multimedia	70	30	100
MCA-402	Artificial Intelligence	70	30	100
MCA-403	Analysis & Design of Computer Algorithms	70	30	100
MCA-404	Operating System - II	70	30	100
MCA-405	Computer Networks - II	70	30	100
MCA-406	Management Information System	35	15	50
MCA-407	Lab – 1 based on 401	70	30	100
MCA-408	Lab – 2 based on 402	70	30	100
Total		525	225	750

**BCA 5th Year / MCA 5th Year**

Paper Code	Nomenclature of Paper	Max Marks		Total
		External	Internal*	
MCA-501	Principles of Programming Languages	70	30	100
MCA-502	Advanced Architecture and Parallel Processing	70	30	100
MCA-503	Object Oriented Design and Modelling	70	30	100
MCA-504	System Simulation and Modelling	70	30	100
MCA-505	Data Mining and Data Warehousing	70	30	100
MCA-506	Project Distribution of marks : Evaluation : 105 Viva-Voce 70 (viva-voce will include Seminar/Presentation Demonstration)	175	75	250
Total		525	225	750

Grand Total of Marks (from 1<sup>st</sup> yr to 5<sup>th</sup> yr) = 3750

**\*Internal Marks in each paper including Practicals, Project report, Training report , Thesis , Lab, Viva-voce etc. as per the following criteria:**

- i) 20% Marks based on two assignments(handwritten) of 10% marks each.**
- ii) 10% Marks for Presentation/Viva-voce.**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Computer basics, Representation of characters in computers, Representation of integers, Representation of Fractions, Hexadecimal representation of numbers  
Decimal to binary Conversion.

Description of computer input units, other input methods, Computer output units. Memory cell, memory Organization, Read Only memory, Serial Access memory, Physical devices used to construct memories, Magnetic Hard Disk, Floppy Disk Drives, CDRom, Magnetic tape drives.

Binary addition, subtraction; signed numbers, Two's Complement representation of numbers, Addition/Subtraction of numbers in 2's Complement notation, Binary multiplication, Binary division, Floating Point representation of numbers.

Why Programming Language ? Assembly language, Higher level programming languages, Some high level languages.

Why do we need an OS?, Batch operating system, Multiprogramming Operating system, Time sharing operating system, Personal Computer Operating System, Unix Operating System, On line and Real time system.

First Generation of Computers, Second generation, Third generation, Fourth generation, Fifth generation, Classification of Computers, Distributed Computer System, Parallel Computer.

Types of Communication with analog computers, need for computer communication networks, Internet and World Wide Web, Characteristics of Communication Channels, Allocation of Channel, Physical communication media, Computer Network Topologies, Communication Protocols, Local Area Networks, ATM Networks, Interconnecting Networks.

**References :**

1. Rajaraman. V., "Fundamental of Computers" (2nd Edition), Prentice Hall of India, "New Delhi, 1996.
2. Sanders, D.H. "Computers Today", McGraw Hill, 1988.
3. Trainer, T .et.al., "Computers" (4th Edition), McGraw Hill, 1994

## **MCA-102 : Computer Programming and Problem Solving using C**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Introduction to algorithms, Flow charts, Tracing flow charts, Problem solving methods, Need for computer languages, Reading programs written in C language, C character set, Identifiers and Keywords, Data types, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, printf, gets, puts functions. Preprocessor commands, #include, Define, ifdef, preparing and running a complete C program.

Operators and expressions, Arithmetic, Unary, Logical, bit-wise, assignment and conditional operators, Library functions, Control statements, While, do-while, for statements, nested loops, if else, switch, break, continue and goto statements, comma operators.

Functions: Defining and accessing : Passing arguments, Function prototypes, Recursion, Use of library functions, Storage classes: Automatic, external and static variables, Arrays: Defining and processing, Passing to a function, Multidimensional arrays, Strings, operations on strings.

Pointers: Declarations, Passing to a function, Operations on pointers, Pointer and arrays,

Arrays of pointers.

Structures: Defining and processing, Passing to a function, Union.

Data Files: Open, close, create, process, Unformatted data files.

### **References:**

1. Hutchison R R, "Programming in C", Tata McGraw Hill, New York, 1990.
2. Johnsonbaugh R, and Kalin M, "Applications Programming in C" MacMillan. N.Y. 1990.
3. Kernighan B.W. and Ritchies D.M. "The C Programming Language" Prentice Hall of India, 1989.
4. E. Balaguruswamy, "Introduction to C", Tata McGraw Hill.
5. Yashwant Kanetkar, "Let us C", Tata McGraw Hill.

## **MCA-I03 : MATHEMATICS-I**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Algebra :** Revision on equation reducible to quadratics and simultaneous equations (linear and quadratic) up to two variables only. Determinants and their six important properties, solutions of simultaneous equations by Cramer's rule.

Matrices, Definition of special matrices (like unit, singular, diagonal matrices etc.) arithmetic operation on matrices, transpose, adjoint reciprocal and inverse of a matrix, solution of simultaneous equations using matrices.

**Trigonometry :** Revision on angle measurement and T -ratios addition, subtraction and transformation formulae. T -ratio of multiple and allied angles.

**Analytical plane geometry :** Cartesian co-ordinates, distance between two: points, area of triangle, locus of a point, straight line, slope and intercept form, general equation of first degree.

**Calculus :** Differential: Limits and functions, differential coefficient, differentiation of standard functions; including function of a function (chain rule), differentiation of implicit functions, logarithmic differentiation, parametric differentiation, elements of successive differentiation.

**Integral:** integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, by partial fractions and by substitution, formal evaluation of definite integrals.

**Differential equations :** definition and formation of ordinary differential equations, equations of first order and first degree, variable separable, homogeneous equations, linear equations and differential equations reducible to these types.

**Statistics :** Measures of central tendency, ideal characteristics, mean, median, mode, GM, HM and weighted arithmetic mean from discrete and continuous frequency distribution, quartiles, deciles and percentiles, measures of dispersion range, quartile deciles and percentiles, measures of dispersion, range, quartile, deviation, mean deviation, standard deviation, calculation of standard deviation

from discrete and continuous frequency distributions, standard error of means, coefficient of variation.

Probability and events Bayes theorem probability theorem, probability distributions, elements of binomial and Poisson distributions, normal distribution.

Linear correlation and regression analysis, scatter plots, method of least squares Pearson's coefficients of correlation.

**References :**

1. R.S. Agarwal, "Modern Approach of Mathematics".
2. Grewal, "Engineering Mathematics"
3. Gupta S.P. and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 1995.

**MCA-104 : Business Flow Systems**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Introduction :** The nature of business and components of business.

**Environment of business system:** Economic and non-economic environment, environment and management, business system, business and economic system.

**Forms of legal ownership :** Sole proprietorship, partnership company and cooperative society-features, formation; merits and demerits.

**Scale of Operation and size of firm :** Measures of size and factors determining size, optimum firm, tendency towards large size.

**Company Management:** Shareholders, board of, directors, chief executive and managing director, Meeting and resolutions, winding up process.

**Horizons of business:** Business combination, rationalization and combination. Public utilities-characteristics rights, duties, ownership and management.

**Business Management:** Nature and importance, Principles of Management, Functions of management-planning organization, staff, directing and controlling scientific management.



**References : Study Material already developed.**

**MCA-105: Operating System-I**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Definition of Operating System, Functions of Operating System, Introduction to Batch systems, Multi programmed batch systems, Time sharing system, Personal Computer system, Parallel system, Distributed system, Real time systems.

Operating system structures: System components, Operating system services, system calls, system programs, System structures, Virtual machines.

Process Concepts, Process scheduling, Operations on processes, CPU scheduling basic criteria, scheduling algorithms, Deadlock's system model, Deadlock characterization,

Methods for handling deadlocks, Memory management, Logical and Physical addresses,

Swapping Concept.

**References:**

1. Silberchatz Galvin, "Operating System Concepts", Wiley Publications.

**MCA-I06 : Communication and Presentation Skills**

**Total Marks : 50**

**External : 35**

**Time : 3 Hour**

**Internal : 15**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

1. Communication Skills: Essentials of Communication skills, Small group communication techniques, Group Discussions etc., Public speaking techniques, Body Language, Interview, Workshop, Dress codes.

2. Presentation Skills : a) Presentation aids : Audio aids, Visual aids, Audio-Visual aids, Printed aids.  
b) Use of Power points.  
c) Meetings : Convening, Preparation, Managing, Post-meeting Follow up.
3. Written Presentation  
a) Preparation of C.V./Resume.  
b) Report writing

**References :**

1. K.K. Sinha, "Business Communication", Galgotia Publishing Company.
2. Rajender Pal, J.S. Korlahalli "Essentials of Business Communication", Himalya Publishing House.

**MCA-201 : Data Structure & Algorithms**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Introduction :** Definitions and Importance of Data Structures, Abstract data types, Storage Structures.

**Linear Lists :** Arrays, address calculation in single and multidimensional arrays, operations on array, sequential search, Binary Search and their complexity analysis, String Handling, variable and fix length strings.

Linked lists and operations on them, circularly linked lists, Doubly linked list, Application of linked list on polynomial expressions and sets., Doubly linked list.

**Trees :** Definition of tree, Binary tree and related terms, Application of binary tree, Tree Traversals, threaded tree, Binary Search Tree, Head, Balanced Tree Definitions.

**Graph :** Representation of graph in memory and various operations on them, Finding path matrix, Warshall' s algorithm, Application of graphs: route problems, Minimum spanning tree.

**Sorting techniques:** Selection, Insertion, Bubble, Merge, Quick, Heap with their complexity analysis.

Hashing techniques

**References :**

1. Schaum Series, "Introduction to Data Structures", McGraw Hill
2. Tenenbaum, "Data Structure using C++", PHI. .

**MCA-202 : Database Management System**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Basic Concepts:** Data, Information, Knowledge, Use of Data as Resource, Data Processing Vs Data Management System, File Oriented Approach, Database oriented approach to Data Management, Characteristics of a Database, Database Management system, Database Administrator, Types of Database system, Data Dictionary, Advantage and Disadvantages of databases systems, Data Models, Schemas & Instances, DBMS Architecture & Data Independence, Data Languages & Interfaces, Data modeling using the Entity, Relationship Approach.:

**Conventional Data Models & Systems:** Network,data Modeling concepts, Constraints in the Network model, Data Manipulation in a Network Database, Hierarchical Database Structures, Integrity Constraints Data definition in the Hierarchical Model.

**Relational Model, Languages & Systems :** Relational Model concepts, Relational model constraints, Relational Algebra, SQL : Data Definition in SQL, view and queries in SQL, Specifying constraints & Indexes in SQL, A Relational Database Management Systems (ORACLE)

**Relational Database Design :** Function Dependencies & Normalizations for Relational Database, Functional Dependencies, Normal Forms based on primary keys (1NF, 2NF, 3NF & BCNF), Lossless join & Dependency preserving decomposition.

**Query Processing :** Basic Algorithms for Executing Query Operations, Using Heuristics in Query Optimization.

**Concurrency Control & Recovery Techniques :** Concurrency Control Techniques, Locking Techniques, Time Stamp Ordering, Granularity of Data items, Recovery Techniques, Recovery Concepts, Database Backup and Recovery from catastrophic failures.

**Distributed Databases and Client Server Architecture:** Distributed Database Concepts Data Fragmentation, Replication and Allocation, Types of Distributed Database Systems, Query Processing in Distributed database, An overview of Client-Server Architecture.

**References :**

1. Elmasri, Navathe, “Fundamentals of Database Systems”, Addison Wesley, New York.
2. J.D. Ullman, J. Widom, “A First Course in Database System”, Pearson Education.
3. Naveen Parkash, “Introduction to Database Management System”, TMH.

**MCA-203 : Digital Electronics**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Fundamental Concepts:** Introduction, Digital Signals, Basic Digital Circuits, Boolean Algebra & Theorems.

**Number System & Codes:** Introduction, Number System - Binary, Octal, Hexadecimal Signed & Unsigned binary Numbers, Binary Arithmetic - addition, subtraction, Codes-BCD, EXCESS-3, Gray, Hexadecimal, Octal, ASCII, EBCDIC, Error codes.

**Combinational Logic Design :** Introduction, Standard forms - SOP & POS, Karnaugh Map-2, 3 & 4 variables, simplification using K maps, Minterms & Maxterms, Don't Care conditions. Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexer/ Encoder, Demultiplexer/Decoder, Comparator, Parity Generator/Checkers, Code Converters.

**Flip Flops :** Introduction, Clocked S-R FF, J-K FF, D-type FF, T type FF, Master Slave JKFF, Edge triggered flip flops, Excitation Tables of Flip Flops.

**Registers :** Introduction, Sequential Circuits, Shift Registers, Serial Input Serial Output, Serial Input Parallel Output, Parallel Input, Parallel Output, Parallel Input Serial Output, Bidirectional Shift Registers, Universal Shift Register.

**Counters :** Introduction, Types-Asynchronous Counter or Ripple Counters, Synchronous Counters, Counter Design.

**Introduction to Digital Logic Families :** Introduction, Characteristics of Digital IC's, Introduction about TTL & CMOS Logic, Tri-State Logic.

**References :**

1. R.P. Jain, "Modern Digital Electronics", TMH.
2. Ghoshal, D.Mohan, Dharminder Kumar, "Digital Electronics", Galgotia Book Source.
3. Malvino Leech, "Digital Computer Electronics", TMH.

**MCA-204 : Computer Organization & Architecture**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks .

Basic Computer Organization, Register Transfer and Micro-operations, Arithmetic and Logic micro-operations, Shift-Micro-operations, computer Instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input-Output and Interrupts Micro-programmed control-unit, Microprogram Sequencer, Central Processing Unit-general register organization, Stack organization, Installations formats, Addressing modes.

Arithmetic Unit, Input-Output Organization, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access, Memory organization, auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

**Reference :**

1. Mano M., “Computer System and Architecture”; 3rd Edition, PHI.
2. Stallings W. “Computer Organizations and Architecture”, 2nd Edition, PHI.

**MCA-205 : Mathematics-II-Discrete Mathematical Structures**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Group and Subgroups :** Group axioms, Permutation Groups, Subgroups, Cosets, Normal subgroups, semi-groups, FREE Semi-groups, Applications, (modular arithmetic, error correcting codes, grammars, language, Finite State Machine).

**Graphs:** Directed and undirected graphs, chains, circuits, paths, cycles, connectivity, Adjacency and incidence matrices, Minima's path Application (Flow charts and state transition graphs, algorithms for determining cycle and minimal paths, polish notation and trees, flows ion networks.).

**Lattices and Boolean Algebra :** Relations to partial ordering, Lattices, Hasse diagram, Axiomatic definition of Boolean algebra as algebraic structures with two operations basic results truth values and truth tables. The algebra of propositional

function. The Boolean algebra of truth values, Applications (Switching circuits, Gate circuits).

**Finite Fields :** Definition Representation, Structure, Integral domain. Irreducible polynomial, polynomial roots, Splitting field.

**References :**

1. Alan Doerr, “Applied Discrete Structures for Computer Science”, Galgotia Publications Pvt. Ltd.
2. Seymour Lipschutz, “Discrete Mathematics”, McGraw-Hill International Editions Marc Lars Lipson, Schaum’s Series.
3. Bernard Kolm and Robert C. Busby, “Discrete Mathematical Structures For Computer Science”, Prentice-Hall of India Pvt. Ltd.
4. Kenneth G. Rosen, “Discrete Mathematics and Its Applications”, McGraw-Hill International Editions, Mathematics Series.

**MCA-206 : Communication Skills - Scientific and Technical Writings**

**Total Marks : 50**

**External : 35**

**Time : 3 Hour**

**Internal : 15**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Basics of Communication Skills Vis-&-Vis Scientific and Technical organizations, Flow of Communication in various scientific and technical organizations: upward, downward, lateral, Communication networks in the scientific and technical organizations, History of various scientific and technical developments, Awareness of general and applied scientific and technical events, Popularization of scientific and technical writings, Achievements of well known scientists of the world, Precautionary measures in scientific and technical writings, Media coverage of scientific and technical writings. Writing science feature, article, editorial, Special article, Interviewing a scientist, facing a press conference by a scientist, Writing a Press Release on the subject relating to science and technology, Delivering a public speech on the matter relating to Science and Technology.

**References :**

1. K: K. Sinha, "Business Communication", Galgotia Publishing Company.
2. H. YushkiAritshus, "COMMUNICATION CULTURE & DEVELOPMENT".
3. Fry Roland, "MANUAL OF COMMERCIAL CORRESPONDENCE".
4. D. Joel Whalen, "I See What You Mean", Sage Publication.

**MCA-301 : Computer Networks****Total Marks : 100****External : 70****Time : 3 Hour****Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Introduction, History and Development of Computer Networks, Advantage of Computer Networks, Topologies, Network Hardware, Network Software, OSI and TCP/IP reference models.

**Physical Layer :** Theoretical basis for data communication, transmission media, type of transmission.

**Medium Access Sublayer :** Channel allocation Problem in Multiple access protocols.

**Local Area Networks:** Introduction, Why Lan, Primary attribute of LAN, IEEE LAN . standards : 802.3, 802.4, 802.5, 802.6 (MAN), FDDI

**Data Link Layer :** Design Issues, Error detection and Correction, Elementary data link Protocols, sliding window protocols.

**Network Layer :** Design issues, Routing algorithms, Congestion Control algorithms, internetworking.

**Transport Layer :** The transport service, Elements of transport protocols.

**Application Layer :** Network Security, DNS, E-Mail, SNMP, USENET, Worldwide Web, Multimedia

Introduction of ISDN and ATM.

**References :**



1. Tannenbaum A.S., “Computer Networks”, PHI, 4th ED., 2003.
2. Uylen Black, “Computer Networks”, PHI, 2nd Edition.,200 1.

### **MCA-302 : Object Oriented Programming using C++**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Object Oriented Concepts:** Paradigms of Object Oriented Programming: Object and Classes, Abstraction, Encapsulation, Information Hiding, Inheritance and Polymorphism Object Modeling.

**C++ Language:** Function in C++, Classes and Objects, Constructors and Destructors, Operator Overloading and Type Conversions, Inheritance: Extending Classes, Pointers, Virtual Functions and Polymorphism, Managing Console I/O Operations, Working with C++ files, Object Oriented System Development, Templates and Exception Handling.

#### **References:**

1. Rambagh J., *et.al.*, “Object Oriented Modeling and Design”, Prentice Hall of India, New Delhi.
2. E.Balagurusamy, “Object Oriented Programming with C++I, Tata McGraw Hill.
3. Timothy Budd, “An Introduction to Object Oriented Programming” Pearson Education Asia, 2001.

### **MCA-303 : Software Engineering**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Introduction:** Software Crisis, Software Processes, Software Life Cycle models:

Waterfall, Prototype, Evolutionary and Spiral models.

**Software Metrics :** Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information flow metrics, Overview of Quality Standards like ISO 9001, SEI-CMM.

**Software Project Planning :** Cost estimation - Static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk Management.

**Software Requirement Analysis and Specification :** Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity Relationship Diagrams, Software Requirement and Specifications, Behavioral and non-behavioral requirements, Software Prototyping.

**Software Design :** Cohesion & Coupling Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented design, User Interface Design, Structured Programming.

**Software Reliability :** Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calendar time Component Reliability Allocation.

**Software Testing :** Software process, Functional Testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing : Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards.

**Software Maintenance:** Management of Maintenance, Fault Reports, Authorizing changes to the product, Ensuring maintainability, Reverse Engineering, Testing During Maintenance.

**Reference:**

1. R.S. Pressman, "Software Engineering- A practitioner's approach", 3rd ed., McGraw Hill Int. Ed. 1992.
2. I. Sommerville, "Software Engineering", Addison Wesley, 1999.
3. P.Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
4. R.Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.

5. K.K. Aggarwal, Yogesh Singh, "Software Engineering", New Age Publication, 2002.
6. Nasib S.Gill, "Software Engineering", Khanna Publications, 2002.

### **MCA-304 : Internet Fundamentals**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions: covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Introduction:** Growth of computer networking, complexity in Network systems, Growth of the Internet, Probing the Internet, Interpreting a ping response, Tracing a route.

Packets, Frames and Error detection, WAN technologies and Routing.

Network ownership, service paradigm and performance

Internet working concepts, Architecture and protocols, IP: Internet protocol addresses, IP Datagrams and Datagram forwarding, IP Encapsulation, Fragmentation, The future IP(IPV 6), TCP Reliable Transport service.

Naming with the Domain name system, Electronic mail Representation and transfer, file transfer and remote file access.

World wide web pages & Browsing, CGI Technology for Dynamic web documents, Network Management & Security.

### **Reference:**

1. Douglas E. Comer, "Computer Networks and Internets", Pearson Education Asia, 2001.

### **MCA-305: Mathematics-III-Computer Oriented Numerical and Statistical Methods Using C**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Total eight questions are to be set by the examiner covering the entire syllabus uniformly. A candidate is required to attempt any five questions: All questions shall carry equal marks.

**Computer Arithmetic :** Floating point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation-pitfalls in computing.

**Iterative Methods :** Bisection, False position, Newton-Raphson methods, Discussion of convergences, Polynomial evaluation, Solving polynomial equations (Bairstow's Methods).

**Solving of Simultaneous Linear Equations and ordinary Differential Equations :** Gauss elimination method, Ill- conditioned equations, Gauss-Seidal Iterative method, Taylors series and Euler methods, Runge-kutta methods, Predictor corrector methods.

**Numerical Differentiation and Integration :** Differentiation ,formulae based on polynomial fit, Pitfalls in differentiation, Trapezoidal, Simpson's rules and Gaussian Quadrature.

**Interpolation and Approximation :** Polynomial. interpolation, Difference tables, Inverse interpolation, Polynomial fitting and other curve fitting. Approximation of functions by Taylor series and chebyshev polynomials.

**Statistical methods :** Sample distributions, Test of Significance,  $\chi^2$ , t and F test.

**Analysis of Variance :** Definition, Assumptions, Cochran's Theorem, One -way classification, ANOVA Table, Two-way classification (with one observation per cell).

**Time Series Analysis :** Components and Analysis of Time Series, Measurement of Trend, Seasonal fluctuations and Cyclic movement.

**References :**

1. Gupta S.P. and Kapoor, V.K., "Fundamentals of Applied statistics", Sultan Chand & Sons, 1996.

2. Gupta S.P. and Kapoor, V.K., “Fundamentals of Applied station statistics”, Sultan Chand & Sons, 1995.
3. Rajaraman, Y., “Computer Oriented Numerical Methods”, Prentice Hall, India.
4. Graybill, “Introduction to Statistics”, McGraw Hill.
5. Anderson, “Statistical Modelling”, McGraw Hill.

### **MCA-306: Social Implications of Information Technology**

**Total Marks :50**

**External : 35**

**Time : 3 Hour**

**Internal : 15**

The objective of this course is to enable the students to debate on Social dimensions of Information Technology. The debates includes social, economic, political and cultural implications of Information and Communication Technologies.

**Note :** Examination will have two sections. In the first section, the examiner is requested. to set five questions each of marks 10. A candidate is required to attempt any three questions from this section. In the second section, which is compulsory, the examiner is requested to set three topics on the current debates on social implications of Information Technology for essay writing. The candidates are required to write an essay of approximately 1000 words on any-one of the topics. The essay will be of 20 marks.

**Introduction :** Importance of social dimensions of science and technology, perspectives on technology and society, debate over the social implications of information and communication technologies.

**Information politics in digital age :** How do social and technical choices reshape access to people, services and technologies. Influencing factors such as geography of access, the architecture of networks, the power of receivers and senders and control over the content.

**Perspectives on role of IT :** Focus on alternative ways in which IT professionals, Social scientists and others have thought about their social and economic role.

Information Technology and the reach of boundaries of business and management, Redesigning of work place, The intelligence household, IT in learning and education.

Debates on digital divide, Privacy and surveillance in everyday life and impact of IT on culture.

### **References :**

1. Dutton, W.H. "Society on the line: Information politics in digital age", Oxford University Press, 1999.
2. Castells M., "The Internet Galaxy" Oxford University Press,
3. Teich, A.H., "Technology and the future", 8th edition, Newyork s1. Martin press.

### **Useful Internet sites:**

<http://www.alteich.com>

<http://www.students.ou.edu.C/Kara.C.chiodo-1/orwell.html>

### **MCA-401 : Computer Graphics and Multimedia**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Graphics Input Devices (Mouse, Light Pen), Graphic display devices-Storage CRT display, Calligraphic display, Raster Scan Display, Line and Circle plotting using Bresenham's algorithm. Circle & Ellipse plotting using Midpoint algorithm. Windowing and Clipping, Sutherland-Cohen approach, Mid-point Sub division algorithm, curve drawing using Hermite polynomial, Bezier curves, B-splines. Picture transformation-translation, rotation, scaling, mirror images. 3-D graphics, 3-D, transformations-rotation about an arbitrary axis, orthogonal projections, multiple views. Isometric projections, perspective projection (1,2,3 vanishing

points). Curved surface generation, hidden surface removal-Z-buffer, Scan-Line, Painters, Area Sub division.

**Multimedia :** Hardware and Software for Multimedia, Application Area for multimedia, Components of Multimedia, Multimedia authoring tools.

**References :**

1. Donald Hearon & M.Pauline Baker; “Computer Graphics”, PHI.
2. Pradeep K. Bhatia , “Computer Graphics”, I.K. International , 2<sup>ND</sup> Ed
2. Roy A.Plastock, Gordan Kalley, “Computer Graphics’;, Schaum’s Outline Series, McGraw Hill.
3. N .Krishnamurthy, “Introduction to Computer Graphics”, Tata McGrawHill.
4. Newman & Sproull, “Principles of Interactive Computer Graphics”, Tata McGrawHill.
5. David F Rogers “Procedural Elements for Computer Graphics”, Tata McGraw Hill
6. Steven Harrington, “Computer Graphics- A Programming Approach”, Tata McGrawHill

**MCA-402 : Artificial Intelligence**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Scope of AI**

Games, theorem proving, natural language processing, vision and speech processing, Robotics, expert systems, AI techniques, search knowledge, abstraction

**Problem solving :**

State space search; Production systems, Search space control, Depth first, breadth first search, heuristic search-Hill climbing, best first search, branch and bound,

Best first search, Problem Reduction, Constraints, Satisfaction, Means End Analysis.

### **Knowledge Representation :**

Predicate logic : Skolemizing queries, Unification, Modus popes, Resolution, dependency directed backtracking

**Rule Based Systems :** Forward reasoning, Conflict resolution, Backward reasoning:

Use of no backtrack.

**Structured Knowledge Representations :** Semantic Net: slots, exceptions and defaults, frames.

**Handling uncertainty :** Probabilistic reasoning, Use of certainty factors, Fuzzy logic  
**Learning :** Concept of learning, learning automation, genetic algorithm, Learning by induction, neural nets back propagation.

### **Expert Systems**

Need and justification for expert systems, Knowledge acquisition, Case studies MYCIN, RI

### **References :**

1. Nilsson, N.J., "Principles of AI", Norosa Publishing House, 1990.
2. Patterson, D.W. "Introduction to AI and Expert System", Prentice Hall of India, 1992.
3. Peter Jackson, "Introduction to Expert system", Addison Wesley Publishing Company, M.A. 1992.
4. Rich, E. and Knight K., "Artificial Intelligence", Tata McGraw Hill (IInd Edition) 1992.
5. SchalkotI, R.J., "Artificial Intelligence-An Engineering Approach", McGraw Hill International Edition, Singapore, 1992.
6. Sasikumar, M, Ramani, S., "Rule Based Expert System", Narosa Publishing House, 1994.



**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Basic definitions & types of Algorithms; Analysis of Algorithms; Solving recurrence relations, Elementary Data Structures, stacks and queues, Trees, Heaps & Heapsort. Graphs its sequential & linked representation.

**Basic Techniques for Algorithms:**

**1. Divide and Conquer**

Problems : Binary search, Finding maximum, minimum, merge sort, quick sort & Strassen's Matrix Multiplication etc.

**2. Greedy Method :**

Problems : Optimal storage on tape, Knapsack problem, Making change ( Money), Minimum Spanning Trees, Single source/shortest path etc Dijkstra's Algorithm.

**3. Dynamic programming :** All pair shortest path, Optimal Binary search trees, I/O Knapsack, the travelling salesperson problem, flow shop scheduling etc.

**4. Backtracking :** The 8 queens problem, Sum of subsets, Knapsack problem & Graph colouring etc.

**5. Branch and Bound :** 0/1 Knapsack problem, Travelling Sales person etc. Lower bound Theory & NP Hard & NP Complete problems.

**References:**

1. Horowitz E and Sahni S., "Fundamental of Algorithm" Galgotia Publications.
2. Aho A.V. Hopcroft, J.E. and Ullman, J.D., "Design and Analysis of Algorithm" Addison Wesley.

3. Brassard G. and Bratney P, "Introduction to algorithms", PHI
4. Manber. D., "Introduction to Algorithms" Addison Wesley.

### **MCA-404 : Operating System-II**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Review of Basic concepts of operating system, Threads, Inter process communication, CPU scheduling criteria, CPU scheduling algorithms, Process synchronisation concepts, Critical section problems, Synchronization hardware, Semaphores, Classical problems of synchronization, monitors.

Basic concepts of Deadlock, Deadlock Prevention, Avoidance and detection, recovery from deadlock, Paging Segmentation, Demand Paging, Thrashing.

File concept, File access methods, Directory structures, Allocation methods, 'free space management, Directory implementation, Disk structure, Disk Scheduling.

Network Operating Systems, Distributed Operating systems, Introduction to UNIX Operating system, Basic Architecture, Memory management and File handling system.

#### **References :**

1. Silberchatz Galvin, "Operating System Concepts", Willey Publications.
2. Deitel, H.M., "An Introduction to Operating Systems Concepts", Addison Wesley.

### **MCA-405 :Computer Networks-II**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

Intorduction to Internetworking concepts, Internet architecture, IP address concept, Mapping of internet address to physical address(ARP), UDP, Internet Protocol(IP) : connection less data delivery, TCP, Routing Protocols : RIP, OSPF, Hello, Mobile IP, Socket Interface.

WAN: Introduction, Circuit switching networks, Packet switching networks, LAN switches, Routers, Bridges.

Internet Security and Firewall Design (IP sec), future ofTCP/IP(IPv6), Internet Tools, Introduction to high speed Networks, Need for High Speed Networks, Performance Attributes, Network Backbone.

Multimedia Applications: user activities and intra-activites, Stand alone multimedia applications, Single user networked applications, Video Conferencing

Multimedia Networking, Multimedia networking applications, Streameny stored audio and video, RTP.

**References:**

1. Douglas E, Comer, “Internet working with TCP/IP, Principles, Protocols, and Architecture”, Fourth Edition, Vol. 1, Pearson Asia Education.
2. Petra Borowka, “Internetworking : The way to a structure of Network”, Thomson computer press.
3. James F. Kurosa, Kath W. Ross, “Computer Networking: A top down approach, featuring the internet”, Pearson Education Asia.
4. Nalin K. Sharda, “Multimedia Information Netrworking”, PHI
5. Neelu Shrivastva, “HighSpeed Networks”

**MCA-406 : Management Information System**

**Total Marks : 50**

**External : 35**

**Time : 3 Hour**

**Internal : 15**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks

Background, Meaning, Nature, Need, Role, Importance, Evolution of Management through information system; Relatedness of MIS with management activities. Management functions and decision making.

Concept of balance, MIS Effectiveness and efficiency criteria.

Development, of MIS : Methodology and Tools, techniques for systematic identification, evaluation, modification of MIS.

**References :**

1. Robert G. Murdick, Joel E. Ross, James R. Claggett, "Information systems for Modern Management"
2. Jallies A.O'Brien, "Management Information System"

**MCA-501 : Principles of Programming Languages**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks

**Preliminaries :** Language paradigms, language criteria, language design trade-offs, Influences on language design, bindings, type checking, and scopes, variable and data, types: primitive data types, variables, structures data types. Abstraction: data abstraction, control abstraction, procedural abstraction.

**Formal languages and automata :** The chomsky hierarchy of formal languages, regular grammars: regular expressions, finite automata, Context free grammars: pushdown automata, ambiguous grammars.

**Imperative Programming :** Structured programming, procedure activations: parameter passing methods, scope rules, and activation records.

**Object oriented programming :** messages, methods and encapsulation, classes and polymorphism, inheritance and object orientation, design issues for object oriented languages.

**Functional programming :** Features of functional languages, implementing functional languages, application of functional languages.

**Logic programming :** Formal logical systems, implementations and applications.

**Languages for databases :** manipulating relational databases using SQL.

**Languages constructs for parallel processing :** the paradigm multiple processes, synchronization of cooperating processes.

**References :**

1. Sabesta W. Robert, "Concepts of programming languages", 4th ed.(Addison Wesley-2000).
2. Apple by Doris & Vandekopple J.Julius, "Programming languages-Paradigm and practices", 2nd ed. (TMH-1999)
3. Sethi Ravi, "Programming languages", 2nd ed.(Addison Wesley-2000)

**MCA-502 : Advanced Architecture and Parallel Processing**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Parallel Computer Models :** The state of computing, Multiprocessors and Multicomputers, Multi vector and SIMD Computer, PRAM and VLSI models.

**Program &, N/W Properties :** Conditions of parallelism, Program Partitioning & Scheduling, Program flow mechanism, System Inter connect Architecture.

**Processor and Memory Hierarchy :** Advanced processor technology, Superscaler and Vector Processor, Memory hierarchy technology, Virtual memory technology.

**Bus Cache and Shared Memory :** Backplane bus system, cache memory organisation, Shared memory organization, Requested and weak consistency model.

**Pipelining and Superscaler Techniques :** Linear pipeline, Nonlinear pipeline, Instruction Pipeline design, Arithmetic Pipeline, Superscalar and superpipeline design.

**Multiprocessor and Multicomputers :** Multiprocessor system Interconnect, Cache Coherence and synchronization mechanism, Message passing mechanism.

**References :**

1. Kai Hwang “Advanced Computer Architecture” MGH Publications.

**MCA-503 : Object Oriented Design and Modelling**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Object Modelling :** Objects and Classes, Links and Associations, Generalisation and Inheritance, Grouping constructs, Aggregation, Generalization as extension and restriction, Multiple Inheritance, Meta data, Candidate keys, Dynamic Modelling, Events and states, Nesting Concurrency Functional Modeling, Data Flow Diagrams specifying operations.

**Analysis :** Object Modeling, Dynamic Modeling, Functional Modeling, Adding Operations, Iteration.

**System Design :** Subsystems Concurrency, Allocation to processors and tasks Management of data stores, Control implementation, Boundary condition, Architectural frameworks, Object design, Optimization, implementation of control. Adjustment of inheritance, Design of associations, Documentation, Comparison of methodologies.

**Implementation :** Using a programming language, a database system, Programming styles, reusability, robustness, programming-in-the-large, case study.

**References :**

1. Booch.G., "Object Oriented Analysis and Design", 2nd edition, Benjamin Cummins Publishing Co. redwood City, CA. USA, 1994.
2. Rebecca Wirfs-Brock, et.al, "Designing Object Oriented Software", Prentice Hall of India, 1996.
3. Rumbaugh.J., et.al. "Object Oriented Modelling and Design", Prentice Hall of India, New Delhi, 1991.

**MCA-504 : System Simulation and Modelling**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note :** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any five questions. All questions shall carry equal marks.

**Defination of System :** Types of system, continuous and discrete; Modelling process and defination of the model, Computer workload and preparation of its models; verification and validation modelling procedures, Comparing model data with real system data; Differential and partial differential equation models; Combining discrete event and continues models; (Examples of a computer system should be used for illustration and discussion purposes)

**Simulation Process :** Uses of simulation; Discrete and continuous simulation procedures; Simulation of a time sharing computer system.

**Simulation languages :** A brief introduction to important discrete and continues simulation languages; study and use of one language (depending on the availability) in detail.

Use of database and A.I. Techniques in the area of modelling and simulation.

**References:**

1. G.Gorden., “System Simulation”
2. N Deo, “System simulation and modelling”

### **MCA-505 : Data Mining and Data Warehousing**

**Total Marks : 100**

**External : 70**

**Time : 3 Hour**

**Internal : 30**

**Note:** Examiner is requested to set eight questions covering the whole syllabi. A candidate is required to attempt any; five questions. All questions shall carry equal marks.

What is Data Mining.? Data Mining: Functionalities, Pattern Interestingness, Classification of data mining system, major issues in data mining.

Why pre-process the data? Data cleaning, Data integration and Transformation, Data reduction

Data Mining Primitives, Data Mining Query Language, Designing G.III based on DMQL, Architecture of Data Mining System

Association rule Mining, Mining single-dimensional Boolean Association rules from transactional databases, Mining multidimensional rules from relational databases & data warehouses, Constraint-based association Mining.

What is classification? What is prediction issues regarding classification & prediction Classification by decision tree induction, Bayesian classification, classification by back propagation .

What is cluster analysis, categorization of major clustering methods, partitioning methods, Hierarchical methods, outlier analysis

Applications and trends in data mining, data mining applications, social impacts of data mining, trends in data mining.

What is data warehouse, a multidimensional data model, Data warehouse architecture, Dataware house implementation.

### **References :**

1. J.Han & Micheline Kamber, “Data Mining-Concepts & Techniques”, Morgan Kaufman Publisher
2. Sam Anahory & Dennis Murray, “Data Warehousing”, Pearson Education



3. Micheal J.A. Berry, Gordan S.Linoff, “Mastering Data Mining”, John Willey & Sons.
4. Clande Seidman, “Data Mining with Microsoft SQL server 2000”, Prentice-Hall India.

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