MASTER OF COMPUTER APPLICATION

(effective from session 2015-16)

1. Duration of the Course

The Master of Computer Application (M.C.A) course will be of six semesters duration which will be conducted in three years. Each semester will be of approximately 5 months (minimum 90 working days in a semester) duration.

2. Eligibility:

Candidates seeking admission to the first semester of Master of Computer Application must have a B.Sc. or equivalent/B.C.A degree (10+2+3 scheme) with minimum 48% marks and also have had Mathematics as a subject at their graduation level from a recognized university.

3. Admissions:

Admissions to the first year of M.C.A. shall be made through Centralized Admission Procedure of the State Government.

4. Medium of Instruction

The medium of instruction and examination shall be English.

5. No. of Seats

There are a total of 60 seats out of which 30 shall be normal fee seats and the remaining 30 self –financed seats.

6. Curriculum

6.1 M.C.A. programme has a three year, six semester prescribed course structure which in general terms is known as curriculum. It prescribes courses to be studied in each semester as given below.

6.2 M.C.A. programme shall have a curriculum and course contents (syllabi) for the courses recommended by the committee courses in Informatics and Computational Sciences and approved by the academic council of the university.

6.3 The programme shall follow Choice Based Credit System(CBCS) and will be governed by the Common Rules and Regulations of Masters programme under CBCS approved by the Academic Council of the University.

7. Courses of Study and Examination

Semester – I

Paper	Paper Name	L-T-P	No.of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
1	2		3	4	5	6
M1MCA1-CT01	Introduction to Information Technology	3-1-0	4	80	20	100
M1MCA2-CT02	Computer Organization	3-1-0	4	80	20	100
M1MCA3-CT03	Introduction to Programming	3-1-0	4	80	20	100
M1MCA4-CT04	Business Functions	3-1-0	4	80	20	100
M1MCA5-CT05	Discrete Mathematics	3-1-0	4	80	20	100
M1MCA6-CP01	Practical-I Digital and Microprocessor Lab.	0-0-8	4	80	20	100
M1MCA7-CP02	Practical-II Computer Programming Lab.-I	0-0-8	4	80	20	100
M1MCA8-SP01	Skill Course	0-0-4	2	20	20	50
	TOTAL		30	550	220	800

Semester – II

Paper	Paper Name	L-T-P	No. of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
1	2	3	4	5	6	7
M2MCA1-CT06	Data Structure	3-1-0	4	80	20	100
M2MCA2-CT07	Computer Architecture	3-1-0	4	80	20	100
M2MCA3-CT08	Object Oriented Programming using C++	3-1-0	4	80	20	100
M2MCA4-CT09	Structured System Analysis and Design	3-1-0	4	80	20	100

M2MCA5-CT10	Numerical Computational Methods	3-0-2	4	80	20	100
M2MCA6-CP03	Data Structure Lab	0-0-8	4	80	20	100
M2MCA7-CP04	Object Orientated Programming Laboratory	0-0-8	4	80	20	100
	TOTAL		28	520	220	800

Semester – III

1	2	3		4	5	6
M3MCA1-CT11	Database Systems	3-1-0	4	80	20	100
M3MCA2-CT12	Operating System	3-1-0	4	80	20	100
M3MCA3-CT13	Algorithms	3-0-2	4	80	20	100
M3MCA4-CT14	Object Oriented Programming using Java	3-1-0	4	80	20	100
M3MCA5-CT15	Computer Networks	3-1-0	4	80	20	100
M3MCA6-CP05	Practical-I: Java Lab.	0-0-8	4	80	20	100
M3MCA7-CP06	Practical-II: Operating System Lab	0-0-8	4	80	20	100
	TOTAL		28			

Semester – IV

Paper	Paper Name	L-T-P	Credits	Max. Marks		Total
				University Exam.	Internal Assessment	
1	2	3	4	5	6	7
M4MCA1-CT16	Compiler Design	3-1-0	4	80	20	100
M4MCA4-CT17	Computer Graphics	3-1-0	4	80	20	100
M4MCA2-CT18	Management and Information Systems	3-1-0	4	80	20	100
M4MCA3-CT19	Network Management and Information Security	3-0-2	4	80	20	100
M4MCA5-CT20	Client Server Computing	3-1-0	4	80	20	100
M4MCA6-CP07	Practical-I: Graphics Lab.	0-0-8	4	80	20	100
M4MCA7-CP08	Practical-II: Client Server Computing Lab.	0-0-8	4	80	20	100
	TOTAL		28	520	220	800

Semester – V

Paper	Paper Name	L-T-P	Credits	Max. Marks		Total
				University Exam.	Internal Assessment	
1	2	3	4	5	6	7
M5MCA1-CT21	Software Engineering	3-0-2	4	80	20	100
M5MCA2-CT22	Modeling and Simulation	3-0-2	4	80	20	100
M5MCA3-ET01X	Discipline Specific Elective-1 (A) Artificial Intelligence (B)Bioinformatics (C) Object Oriented Modeling & Design	3-1-0	4	80	20	100
M5MCA4-ET02X	Discipline Specific Elective-2 (A)Data Mining (B)Advanced Java Programming (C)Multimedia Web design	3-1-0	4	80	20	100
M5MCA5-ET06X	Discipline Specific Elective-3 (A)Embedded System Design (B)Information security & Cryptography (C)Image Processing	3-1-0	4	80	20	100
M5MCA6-EP02	Practical-I: Minor Project.	0-0-8	4	80	20	100
M5MCA7-EP03	Practical-II Elective Lab.	0-0-8	4	80	20	100
	TOTAL		28			

Semester – VI

Paper	Paper Name		No. credits	Max. Marks		Total
				University Exam.	Internal Assessment	
1	2	3	4	5	6	7
M6MCA1-CP09	Project Work	0-0-36	18	80	20	100
			18			

Grand Total Credits for all six semesters	160			
No. of Core Course Credits	138			
No. of Discipline Specific Course Credits	20			
No.of Credits for SGPA and CGPA calculation	158			
No. of Skill course credits	02			

Total Credits: 160

Course Code

Course codes are written in the following format

Masters programme (M)+Semester (1,2,34)+MCA(Computer Application Discipline)+Serial Number of Course in the Semester(01,02,03 etc)+ hyphen("-") +Course type [Core Theory (CT), Core Practical(CP), Discipline Specific Theory (ET), Discipline Specific Practical (EP), Skill Practical(SP)]+Group Code (A,B,C etc)

For example the Course code M1MCA01-CT01 should read as Master Programme First Semester Information Technology First Course-Core Theory Course-01
In the Course code M3MCA06- EP01A should read as Master Programme Third Semester Information Technology Sixth Course-Discipline Specific Elective Practical Course-01 Group-A

SYLLABUS

M.C.A SEMESTER-I

: Introduction to Information Technology

(Note : Only introductory concepts to be taught in the course.)

UNIT- I

Information Concepts and Processing: Definition, Need, Qualities, value of information. Categories of information in business organization, levels of information, data concepts, logical and physical concepts, data processing, Introduction to office automation.

Number systems: Binary numbers, octal numbers, hexadecimal numbers, Radix- decimal, octal, hexadecimal, conversion from one form to another-Examples, Representation of decimal, octal, hexadecimal numbers: fractional numbers and signed numbers, 1's and 2's complement forms, Binary arithmetic-addition, subtraction ,multiplication and division-Examples. Codes-Various types- ASCII and 8 bit EBCDIC

UNIT-II

An overview of a computer system: components of a computer system, various I/O and auxiliary storage devices

System software (Only Introductory level): Introduction to system software, Distinction between systems software and Application software. Introductory ideas of loaders and linkers

High level language (Only Introductory level): Different languages, introduction to Assemblers, Compilers and Interpreters, relative merits of compilers v/s interpreters

UNIT-III

Operating systems (Only introductory level): Evolution, introduction to OS , functions and facilities, single tasking and multitasking OS , single user and multi-user OS, characteristics of MS-DOS and Unix operating systems , DOS and UNIX commands for file and process management.

UNIT-IV

Text editors: overview of editing process

Graphical User Interfaces- Introduction to Windows, Word processing software packages and features, spread sheet packages and features

Database : Introduction to database and database packages.

Desktop Publishing: Introduction to desktop publishing and desk top publishing packages.

UNIT-V

Computer Communications (Only Introductory level) : Computer to computer communication through networking, Introduction to computer networks and networking software, Types of Networks, Internet and Intranet , Electronic mail.

Multimedia and Virtual reality: Introduction to Multimedia and Virtual reality

Specifications of a typical desktop computer system, Recent Developments in ICT

Recommended books:

1. Satish Jain , Information Technology
2. Alexis Leon , Fundamentals Of Information Technology
3. V.Rajaraman : Fundamentals of Computers

Paper-II (MCA-102/CS-02):Computer Organization

UNIT-I

Introduction

Introduction: Structured Computer Organization: languages, levels and virtual machines, contemporary multilevel machines, evolution of multilevel machines. Milestones in Computer Architecture: various generations. The computer Zoo: technological and economic forces, the computer spectrum. Example computer families.

UNIT-II

Computer System Organization

Computer Systems Organization: Processors: CPU organization, instruction execution, RISC versus CISC, design principles for modern computers, instruction-level parallelism, processor-level parallelism. Primary Memory: Bits, memory addresses, byte ordering, error-

correcting codes, cache memory, memory packaging and types. Secondary Memory: Memory hierarchies, magnetic disks, floppy disks, IDE disks, SCSI disks, RAID, CD-ROMs, CD-Recordables, DVD. INPUT/OUTPUT: Buses, terminals, mice, printers, modems, character codes.

UNIT-III

Digital Logic Level

The Digital Logic Level: Gates and Boolean Algebra: Gates, boolean algebra, implementation of boolean functions, circuit equivalence. Basic Digital Logic Circuits: Integrated circuits, combinational circuits, arithmetic circuits, clocks. Memory: Latches, flip-flops, registers, memory organization, memory chips, RAMs and ROMs. CPU Chips and Buses: CPU chips, computer buses, bus width, bus clocking, bus arbitration, bus operations. Example CPU chips and example buses. Interfacing: I/O chips, address decoding.

UNIT-IV

The Micro-Architecture Level

The Micro-architecture Level: An example micro-architecture: The data path, micro-instructions, micro-instruction control the MIC-1. An example ISA: IJVM: Stacks, the IJVM memory model, the IJVM instruction set, compiling Java to IJVM. An example implementation: micro-instruction and notation, implementation of IJVM using Mic-1. Design of the micro-architecture level: Speed versus cost, reducing the execution path length, a design with pre-fetching the Mic-2, a pipelined design the Mic-3, a seven-stage pipeline the Mic-4. Improving performance: Cache memory, branch prediction, out-of-order execution and register renaming, speculative execution. Examples of the micro-architecture level.

UNIT-V

Microprocessors

Microprocessors: Architecture of 8085 microprocessor; instructions of 8085, addressing modes, introduction to assembly language programming.

Recent Developments in Computer Hardware(CPU, Chipsets, memories, disks & interfaces used in desktops)

Text Books:

1. A.S.Tannenbaum : Structured Computer Organization.
2. Ramesh Gaonkar: Introduction to microprocessors.

Reference Books:

1. Thomas C. Bartee : Digital Computer Fundamentals.
2. Duglus V. Hall : Microprocessors and Interfacing: programming and Hardware.

Paper-III (MCA-103/CS-03):Introduction to Programming

UNIT - I

Algorithm development: problem identification, algorithms, flow charts, testing and debugging, algorithms for searching (linear and binary), sorting (selection, bubble & insertion), merging of ordered list, analysis of algorithm.

UNIT – II

Programming in C: history, structure of C programs, compilation and execution of C programs, debugging techniques, character set, keywords, data type and variables, expressions, operators, operator precedence and their order of evaluation.

Control statements **-** if-else, switch, break, continue, coma operator, goto statement. Loops **-** for, while, do-while.

UNIT – III

Functions: built-in and user-defined functions function declaration, parameter passing- call by value & call by reference, recursive functions. storage classes - auto, extern, global and static.

Array: one dimensional and multi-dimensional array, array handling, passing arrays to functions, arrays and strings, string-handling functions.

UNIT – IV

Pointers: pointer variable and its importance, pointer arithmetic, array of pointers, function of pointers, structure of pointers, dynamic memory allocation functions, pointer to pointer.

Structures and Union : declaration of structures, pointer to structure, array of structure, pointer to function, self-referential structure, unions, enumeration, macro.

UNIT – V

File handling: opening and closing data file, creating a data file, read and write functions, formatted and unformatted data files, command line arguments.

Recommended books : How to solve it by computer - G. Dromey
Programming with C – Schaum's outline Series

Paper-IV (MCA-104) :Business Functions

UNIT-I

Background : What is a business firm, classification by formation (Ownership) viz.. Sole proprietorship, Partnership, Private Limited Companies and Public Limited companies Public sector Companies, Trusts, Government Departments, Financial Institutions and Nationalized and other Banks; Classification by activity e.g. Trading, Manufacturing, services like banking, Insurance etc.

UNIT-II

Basics of Business Functions: Sales: customer Order processing; Invoicing, Sales analysis; In Trading and manufacturing contexts; account receivables. **Materials Purchase:** Indents for purchase; Purchase order generation; follow-up, amendments and cancellation; Delivery schedules; suppliers bill passing; Accounts.

UNIT-III

Material receipt: Suppliers delivery challan; verification with purchase orders; inspection; Goods receipt note; maintenance of materials ledger. **Material Issues:** Requisition for issues and updating materials ledger; valuation of issues and debiting respective departments. Inventory records: Maintenance of item wise ledgers; passing with Receipts and issues; valuation of closing stock by different methods FIFO, LIFO and weighted average.

UNIT-IV Inventory control: Principle of selective control; ABC and FSN analyses, Maximum and minimum levels; reordering levels and safety stock; reorder quantity. **Personnel:** Employee record, Pay roll; pay slip preparation; updation, accounting entries; summary statements-department wise summary, summary of earnings & deductions; coinage analysis.

UNIT-V: Accounting : Principles and Concepts: Transaction entries, Credits and debits, double entry system of accounting, Journal entries, transaction documents, ledgers and other books of accounts; daily posting and maintenance of day books, Control accounts, Ledger posting and closing, trial balance, Illustrations and examples. Final Accounts- Profit and loss and balance sheet compilation from trial balance, Illustration and examples. Cash flow and Funds flow-Sources and application of funds.

Recommended Books:

1. D.H.Sanders : Computers in Business
2. Hongren & Sundem : Introduction to Financial Accounting
3. H.Chakraborty : Advanced Accounting
4. I.M.Pandey : Financial Management

Paper-V(MCA-105/CS-04):Discrete Mathematics

UNIT-I

Set Theory: Introduction, sets and elements, universal set and empty set, subsets, venn diagram, set operations, algebra of sets and duality, finite sets, counting principle, classes of sets, power sets, partitions, mathematical induction.

Relations: Introduction, product set, relations, pictorial representation of relations, composition of relations, types of relations, closure properties, equivalence relations, partial ordering relations, n-ary relations.

UNIT-II

Functions: One-to-one onto and invertible functions, mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recursively defined functions, cardinality.

Logic and Propositional calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of proposition, conditional and bi-conditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements.

UNIT-III

Matrices: Matrix addition and scalar multiplication, matrix multiplication, transpose, square matrices, invertible matrices, inverse, determinants, elementary row operations, Gaussian elimination, boolean matrices.

UNIT-IV

Counting: Basic counting principles, factorial notation, binomial coefficient, permutations, combinations, the pigeon-hole principle, the inclusion-exclusion principle, ordered and unordered partition.

Probability Theory: Introduction, Sample space and events, finite probability space, conditional probability, independent events, independent repeated trials, binomial distribution, random variables.

UNIT-V

Property of Integers: Order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations.

Recommended Books :

1. Lipschutz S., Lipson M. :Discrete Mathematics
2. Kolman B.,Robert C.B., Sharon R.: Discrete Mathematical Structures
3. Trembley J.P. and Manohar R.P. : Discrete Mathematical Structures with Applications to Computer Science.
4. Lew : Computer Science : A mathematical introduction

Paper VI (MCA - 106:PRACTICAL-I Computer Hardware Lab

Experiments based on Paper II

Paper VI (MCA-116): PRACTICAL-I Business Function Lab

Experiments based on Paper-IV using MS ACCESS/TALLY etc.

Paper-VII (MCA - 107):PRACTICAL -II Programming Lab

Unix/Linux Commands, Implementing simple algorithm to learn C , Programming using C to under stand different data structure and to implement different algorithm. Students are required to use compilers under UNIX/LINUX .

Paper VIII(MCA-108) Practical-III: English language & Communication Skill

Section A: Oral Communication Competence 60 hrs

Section B: Group Discussion and Personality Development 60 hrs

MCA SEMESTER – II

Paper-I (MCA-201/CS 05):Data Structure

UNIT-I

Data Type - Data Object - Data Structure : Data abstraction and abstract data type; Notion of an algorithm - Complexity measures : Rate of growth, basic time analysis of an algorithm; ordering notion - detailed timing analysis - space complexity.

Arrays: Arrays and their representation-Single and multidimensional arrays-row major and column major ordering-address calculation.

Linked lists: Pointers and their uses- Continuous vs linked storage. Singly and doubly linked lists-Operations on lists-representation of Sparse matrices and polynomials using lists-Circular lists-generalized lists

UNIT-II

Storage management: Dynamic storage management-Reclamation and compaction-Boundary Tag method.

Stacks and Queues: Stacks and Queues-representation and Manipulation-Uses of stacks and Queues-Recursion, polish expressions

UNIT-III

Trees: Trees-Binary and N-ary trees-Representation of trees-Tree traversal algorithms-Threaded trees and advantages-Conversion of general trees to Binary trees-B trees-Applications: Decision trees, Game trees and expression parsing.

UNIT-IV

Graphs: Graphs and their representations**:** Matrix representation-List structure-Graph traversal algorithm, Application of graphs.

Strings and their features: Strings-Representation and Manipulation using Arrays and lists-String matching algorithms. Brute force, Knuth-Morris-Pratt and Boyer-Moore strategies.

UNIT-V

Sorting and Searching: Searching and sorting-Sequential, Binary and hashed Searching-Bubble sort, Insertion sort, shell sort, Merge sort and Quick sort-Comparison.

Tables: Decision tables-Symbol tables-Hash Tables-Examples of representation and implementation-Applications.

Reccomended Books :

1. Aho A.V. & Ullman J.E. : Data Structure & Algorithms
2. Aron M. Tannenbaum & Others : Data Structures using C
3. Mary E.S. Loomis : Data Management & File Structures

4. Bhagat Singh & Thomas Naps : Intrioduction to Data Structures
5. Trembley & Sorenson : An Introduction to Data Structures with Applications

Paper-II (MCA-202/CS-06):Computer Architecture

Unit I Processor Basics

Processor Basics: CPU Organization: Fundamentals, additional features. Data representation: Basic formats, fixed point numbers, floating-point numbers. Instuction sets: Instruction formats, instruction types, programming considerations.

Unit II Datapath Design

Datapath Design: Fixed point arithmetic: Addition and subtraction, multiplication, division. Arithmetic Logic Unit: Combinational ALUs, sequential ALUs. Advanced topics: Floating-point arithmetic, pipeline processing.

Unit III Control Design

Control Design: Basic concepts: Introduction, hardwired control, design examples. Micro-programmed control: Basic concepts, multiplier control unit, CPU control unit. Pipeline control: Instruction pipelines, pipeline performance, super-scalar processing.

Unit IV Memory Organization

Memory Organization: Memory technology: Memory device characteristics, random-access memories, serial-access memories. Memory systems: Multilevel memories, address translation, memory allocation. Caches: Main features, address mapping, structure versus performance.

Unit V System Organization

System Organization: IO and System Control: Programmed IO, DMA and interrupts, IO processors. Parallel processing: Processor-level parallelism, multiprocessors.

Text Books:

1. J.P. Hayes: Computer Architecture and Organization, McGraw-Hill International editions.

Paper- III (MCA-203/CS-07):Object Oriented Programming using C++

UNIT – I

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism. abstraction.

C++ basics: structure of a C++ program, data types, declaration of variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT – II

C++ classes and data abstraction: class definition, class structure, class objects, class scope, this pointer, static class members, constant member functions, constructors and destructors, dynamic creation and destruction of objects, friend function and class, static class member.

Overloading : function overloading, operator overloading – unary, binary operators.

UNIT - III

Inheritance: defining a class hierarchy, different forms of inheritance, defining the base and derived classes, access to the base class members, base and derived class construction, destructors, virtual base class.

Polymorphism: static and dynamic bindings, base and derived class virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.

UNIT - IV

Templates - function templates and class templates, overloading of function template, static class member in class template.

Exception handling: benefits of exception handling, throwing an exception, the try block, catching an exception, exception objects, exception specifications, rethrowing an exception, catching all exceptions.

UNIT-V

File handling : stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.

Standard template library (STL): component of STL, containers, iterartors, algorithms, application of container classes.

Recommended book : Object Oriented Programming with C++ : E. Balagurusamy

Paper-IV(MCA-204/CS-08):Structured System Analysis and Design

Unit I

Overview:

Introduction, The System Development Life Cycle, System Development Methodologies, Project team roles and skills.

Planning Phase: Identifying business value, Feasibility Analysis, creating the work plan, staffing the project, controlling and directing the project.

Unit II

Analysis Phase:

System Analysis - analysis process, business process automation, business process improvement, business process reengineering, developing the analysis plan.

Gathering Information – interviews, joint application design, questionnaires, document analysis, observation, selecting the appropriate technique.

Process Modeling – data flow diagrams, Use cases.

Data Modeling – ER diagram.

Unit III

Design Phase:

System Design – design strategies, developing the design plan, moving from logical to physical model.

Architecture Design – computing architectures, infrastructure design, global issues, security.

User Interface(UI) – principles of UI design, UI design process, navigation design, input design, output design.

Data Storage Design – data storage formats, optimizing data storage.

Program Design – structure chart, program specification.

Unit IV

Implementation Phase:

Construction - managing programming,

Designing tests - Test Plan, Unit Tests, Integration Tests, System Test, Acceptance Tests

Developing Documentation- Types of Documentation, Designing Documentation Structure , Writing Documentation Topics

Installation – Conversion- Style, Location and Modules, change management,

Post implementation activities- System Support, System Maintenance, Project Assessment.

Unit V

Hardware and Software Selection: Procedure for Hardware and Software Selection, Financial considerations in selection – Rent, Lease, Purchase

Security , Disaster/ Recovery and Ethics in System Development : Threats to System Security, Control Measures, Disaster/ recovery planning, Ethics, Codes and Standards of Behavior

Modern Trends: The object approach, use case diagram, sequence diagram, class diagram, statechart diagram.

Recommended Books :

1) Alan Dennis, Barabara Haley Wixom : Systems Analysis and Design- An Applied Approach.
2) Elias M Awad : Systems Analysis and Design.

Paper -V(MCA-205/CS-09):Computer Oriented Numerical and statistical techniques

UNIT-1

Floating point Arithmetic: Basic Concepts of floating point number systems, implications of finite precision, Illustration of errors due to round off.

Solution of non-linear Equations: Bisection, Fixed point iteration, Newton's method, rates of Convergence.

UNIT-2

Direct Methods for Linear Systems of Equations: Gaussian elimination, Operational counts, Implementation including pivoting and scaling.

Iterative methods: Jacobi's method, Gauss Seidal method, Acceleration of iterative methods, Relaxation method.

UNIT-3

Computation of Eigen values and Eigen vectors: Basic theorems. Error estimates, the power method, Jacobi's method, House holder's method.

UNIT-4

Solution of Ordinary differential equations: Taylor series method, Euler's methods with local and global error analysis, Runge-Kutta Methods, Predictor-Corrector methods: Automatic error monitoring, change of step size and order.

UNIT-5

Probability: Sample spaces, events as subsets, probability axioms, sample theorems, Binomial coefficients and counting techniques applied to probability problems, Conditional probability, Independent events, Baye's formula.

Random Variables and their distribution : Random variables (discrete and continuous), probability functions, density and distribution functions, special distributions (Binomial, Poisson, Exponential, etc.), mean and variance, independent random variables, functions of random variables and their distributions.

Text/Recommended books:

1. K. Sankara Rao: Numerical Methods for Scientists and Engineers
2. V. Rajaraman: Computer Oriented Numerical Methods

3. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics

Paper-VI(MCA-206):Practical-I C++ Programming Lab.

Introduction to Eclipse- Workbench, perspectives, views and debugging, team programming concepts with CVS, testing with JUnit, Build tool Ant.
C++ Programming problems based on course in paper – III.

Paper-VII(MCA-207):Practical-II Data Structure Lab

Implementation of data structure algorithms.

MCA SEMESTER – III

Paper-I (MCA-301/CS-10):Database Systems

UNIT - I

Introduction : Database system applications, database systems versus file systems, views of data, data models, database languages, database users and administrators, transaction management, database system structure, application architecture.

Data modeling using the Entity Relationship Model**:** ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, unique key, generalization, aggregation, reduction of an ER diagram to tables.

UNIT - II

Relational model : Structure of relational databases, relational algebra, tuple relational calculus, domain relational calculus.

SQL : Characteristics of SQL, advantages of SQL, types of SQL commands, SQL operators and their procedure, tables, views and indexes, queries and sub-queries, aggregate functions, insert, update and delete operations, joins, union, intersection, minus, cursors in SQL. domain constraints, referential integrity, assertions, triggers, authorization and authentication.

UNIT - III

Relational database design & normalization : Functional dependencies, normal forms- First, second, third, BCNF, fourth and fifth normal forms, decomposition.

Indexing and Hashing: Basic concepts, ordered indices, B-tree, B+ tree, static hashing, dynamic hashing, comparison of ordered indexing and hashing, index definition in SQL, multiple-key access.

UNIT - IV

Query Processing & Optimization : Measure of query cost, selection operation, sorting, join operation, other operations, evaluation of expressions, estimating statistics of expression results, transformation of relational expression, evaluation plans, materialized views.

Transactions: Transaction concept, atomicity and durability, concurrent execution, serializability – conflict and view, testing of serializability.

UNIT - V

Concurrency Control : Concurrency Control, Locking Techniques for Concurrency control, Time stamping protocols for concurrency control, validation based protocols, multiple granularity, multi-version schemes, deadlock handling, insert and delete operations.

Recovery System : Failure classification, storage structure, recovery and atomicity, log based recovery, shadow paging, recovery with concurrent transactions, buffer management, backup systems.

Recommended Book : Database Systems Concepts - Korth

Fundamental of database system - Elmasiri and Navathe

Paper-II (MCA-302/CS-11):Operating systems

Unit I Introduction to Operating Systems, Computer System Structures and Operating System Structures

Introduction to Operating Systems: What is an operating system? Mainframe systems, desktop systems, multiprocessor systems, distributed systems, clustered systems, real-time systems, handheld systems. Feature migration and computing Environments.

Computer System Structures: Computer system operation. I/O structure, storage structure, storage hierarchy, hardware protection, network structure.

Operating System Structures: System components, operating system services. System calls, system programs, system structure, virtual machines.

Unit II: Processes and Threads

Processes: Process concept, process scheduling, operations on processes, cooperating processes, inter-process communication, communication in client-server systems.

Threads: Overview, multithreading models, threading issues.

Unit III CPU Scheduling, Process Synchronization and Deadlocks

CPU Scheduling: Basic Concepts, scheduling criteria, scheduling algorithms, multiple-processor scheduling, real-time scheduling, algorithm evaluation.

Process Synchronization: The critical section problem, synchronization hardware, semaphores, classical problems of synchronization, monitors.

Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Unit IV Storage Management

Memory Management: Swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: Demand paging, process creation, page replacement, allocation of frames, thrashing.

File System Interface: File concept, access methods, directory structure, file system mounting, file sharing, protection.

File-System Implementation: File system structure, file-system implementation, directory implementation, allocation methods, free space management, efficiency and performance.

Unit V Protection and Security

Protection: Goals of protection, domain of protection, access matrix, implementation of access matrix, revocation of access rights.

Security: The security problem, user authentication, program threats, system threats, security systems and facilities, intrusion detection, cryptography.

Paper-III (MCA-303/CS-12):Algorithms

UNIT-1

Algorithms Analysis: Algorithms and structured programming. Analysing algorithms, Asymptotic behavior of an algorithm, Order notations, time and space complexities (polynomial, logarithmic and exponential), average and worst case analysis, lower and upper bounds.

UNIT-2

Algorithm design strategies: Divide and conquer (Merge sort, Quick sort, matrix multiplication).

Greedy method (knapsack problem, job sequencing with deadlines, minimum spanning trees).

Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

UNIT-3

Dynamic programming: 0/1 knapsack, Travelling salesman problem

Backtracking: 8-queen problem, sum of subsets, Graph coloring, 0/1 Knapsack

Branch & Bound: 0/1 knapsack, Travelling salesman.

Algorithms on Graphs: Minimum cost spanning trees, depth-first search, bi-connectivity, strong connectivity, path finding problem, transitive closure algorithm

UNIT-4

Matrix algorithms: Basics, Strassen's matrix-multiplication algorithm, LU and LUP decomposition, inversion of matrices

Data structures for set manipulation problems: Fundamental operation on sets, a simple disjoint-set union algorithm, tree structures for UNION-FIND problem, applications and extensions of the UNION-FIND algorithm.

UNIT-5

Pattern matching algorithms: Finite automata and regular expression, recognition of regular expression, patterns, recognition of substrings, Conversion from NFA to DFA

Taxonomy of Classes: Problem classes P, NP, NP-hard and NP-complete, Theorems for some NP-complete problems

Text/Reference Books:

1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications, 1985.
2. Design & Analysis of Computer Algorithms, Av. Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Design and Analysis of algorithms, S.K. Basu, PHI Publications

Paper-IV(MCA-304/CS-13):Object Oriented Programming using Java

UNIT-I

Introduction to Java: Bytecode, features of Java, data types, variables and arrays, operators, control statements.

Objects & Classes: Object Oriented Programming, defining classes, static fields and methods, object construction

UNIT-II

Inheritance: Basics, using super, method overriding, using abstract classes, using final with inheritance.

Packages and Interfaces: Defining a package, importing package, defining an interface, implementing and applying interfaces.

UNIT-III

Exception Handling: Fundamentals, exception types, using try and cache.

Multithreaded Programming: Creating a single and multiple threads, thread priorities, synchronization.

UNIT-IV

Applets: Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets.

Event Handling: Event classes and event listener interfaces.

UNIT-V:

Graphic Programming Introduction to swings.

Recommended Books :

1. P. Naughton and H. Schildt: The complete reference to Java, Tata Mc-Graw Hill.
2. Deitel and Dietel: How to program in Java

Paper-V(MCA305/CS-14) :Computer Networks

UNIT-I

Protocol Architecture : Overview: Communication model, Communication Tasks, Data Communication Networking: WAN, LAN,Wireless Networks. Basics of Network Software: Protocol and protocol architecture, Protocol functions, Design Issues for the layers, interfaces &Services, Connection oriented and connectionless services, service primitives, relationship of services to protocols , ISO REF Models, TCP/IP Model.

Data Communications: Data Transmission: Concepts of Frequency,Spectrum, bandwidth, Electromagnetic spectrum and frequencies for data communication, Fourier analysis , Data and signal, Transmission impairments, channel capacity, Nyquist bandwidth, Shannon capacity formula ,decibels and signal strength, Transmission media:Coaxial, twisted pair, Comparative study of Categories of cables, Coaxial, Optical Fibers, Wireless transmission: TerrestialMicrowave, satellite,Broadcast Radio,Infrared,.

UNIT-II

Data Encoding: BCA (NRZ,Bipolar AMI, B8ZS, HDB3,ASK,FSK,PSK,PCM,AM,FM,PM), Spread Spectrum. Asynchrous and Synchronous transmission, Full and Half duplex, Interfacing, Functional and Procedural aspects of V.24,

Data Link Control: Flow control: Stop and Wait, Sliding window, Error detection: Parity Check,CRC. Error control: Stop and Wait ARQ, Go back-N ARQ, Selective-Reject ARQ, Brief idea of HDLC and other Data Link control protocols

UNIT-III

Circuit Switching: Simple switching Network, Circuit Switching Networks, Circuit Switching Concepts: Space Division switching, Time Division Multiplexing, Routing in circuit switching Networks, Contrl Signalling, Inchannel & common channel signaling, Brief idea of SS7. Packet Switching: Packet switching principles, Routing,X.20

UNIT-IV

LAN Technology: LAN architecture, IEEE 802 standards, Ethernet (CSMA/CD): Medium Access Control, 10, 100, Gigabit Ethernet. Brief survey of other LAN systems (Token ring,FDDI,ATM, Fiber channel). Wireless LANS, Bridges, Latest trends in LAN technologies LAN Devices: Study of specifications of L2 and L3 switches, Structured cabling, Passive components.

UNIT-V

Principles of Internetworking, connection less Internetworking, IP, IPv6, IP multicasting. Routing protocols, TCP, UDP, SNMP,SMTP and MIME, HTTP.

Recommended Books :

1. William Stallings: Data & Communications,Sixth Edition
2. A. S. Tanenbaum : Computer Networks

Paper-VI(MCA-306):Practical-I: Java Lab

Java Programming problems based on course in paper - IV

Paper-VII(MCA-307):Practical-II Operating Systems Lab

UNIX based practical. Introduction to Linux, commands and shell programming, system programming.

Paper VII (MCA-317) Practical-II Network Laboratory : Laboratory exercises for CISCO Certification

SEMESTER - IV

Paper-I(MCA-401/CS-15):Compiler Design

UNIT-I

Introduction : Analysis of source programme, Different phases of a compiler, Symbol Table. Error Handling **:** errors in different phases of compiler. Introduction to Compiler Construction Tools.

Lexical Analysis : Different approaches to design a lexical analyzer, regular expression, finite automata (Deterministic & Non-deterministic). RE to NFA and NFA to DFA. Optimization of DFA states. Implementation of lexical analyzer.

UNIT-II

Syntax analysis : context free grammer, Parsing techniques (Top-down, Bottom-up, Operator-precedence, SLR.

UNIT-III

Syntax Directed Translation: Syntax directed translation, construction of Syntax Trees, bottom-up evaluation of S-attributed definitions, L-attributed definitions, top-down translation, bottom-up evaluation of inherited attributes

Type Checking: Type Systems, specification of a simple type checker, equivalence of type expressions, type conversions

UNIT-IV:
Run time Environment: Source language issues, stograte organization, storage allocations strategies, symbol tables

Intermediate code generation: Intermediate language, syntax directed translation, assignment statement, boolean statements and backpatching, array references, procedure calls and record structure.

UNIT-V

Code optimization : Principal sources of optimization, Local & Loop optimization, loop invarient computations, induction variable elimination.

Code generation : Design of code generation, a machine model, a simple code generator, register allocation & assignment, code generation from DAG's.

Text/Reference Books :

1. Principles of Compiler Design by Aho, Ullman; Narosa Publishing House, 1989
2. Compilers : Principles, techniques and tools by Aho, Sethi, Ullman; Wesley 1988
3. Compiler Construction : Theory & Practice by Barrat, Eates, Cought, Galgotia 1988
4. Compiler Writing by Trembly, Sorenson ; Mc-Graw Hill Book Co.
5. Compiler Construction for Digital Computer by Gries; John Willey & Sons, New York – 1987

Paper-II (MCA-402/CS-16) :Management and Information System

Unit I

Basic concepts of management: Introduction to Management: Meaning and definitions of management, Management – An art or science, Management As a Profession, Management Vs. Administration, Different schools of management thought – Behavioural and Scientific, Principles of Management, Managerial skills, Levels of Management

Functions of Management (Introductory ideas) – Planning, Organizing, Staffing, Directing, Controlling, Leadership, Decision making

Unit II

Motivation : Concept, Theories of Motivation : Maslow, Herzberg and McGregor, Financial and Non financial incentives.

Leadership : Concept, Functions of Leader, Leadership styles

Communication : Process, Communication channels and Barriers, Essentials of effective Communication

Decisions : Characteristics of Business decisions, Rational Decision Making and its problems, Herbort Simon Model of decision making, Types of Decisions

Staffing: Concept, Recruitment & Selection, Training & Development, Performance Appraisal

Unit III

Information : Definition, Attributes of Information, Classification of Information

Perspectives on Information System: What is an information system?, Dimensions of information system, Contemporary Approaches to information system : Technical approach, behavioral approach and socio technical approach **.**

Organizations and Information System: Impact of Information system on organizations: Economic Impact , Organizational and Behavioural Impact, Impact of IT on management decision making : How IT affects management decision making , The role of managers in Organizations, Models of Decision Making, Implications for the Design and understanding of Information system

Unit IV

Major Types of Systems in Organizations: Executive Support System (ESS) , Management Information System (MIS), Decision Support System (DSS) , Transaction Processing System (TPS).

Systems from a functional Perspective: Sales and Marketing Systems, Manufacturing and Production Systems, Finance and Accounting Systems, Human Resource Systems.

Management Information System: Definition, Role of MIS, Impact of MIS, Management as a control system, MIS : A Support to the management.

Development of MIS : Approaches to Development : Prototype Approach, Life Cycle Approach, Implementation of MIS

Unit V

Current Issues in Information Systems: E-commerce, Enterprise Resource Planning (ERP), Supply Chain Management (SCM), Customer Relationship Management (CRM), Expert System (ES) , Knowledge Management System (KMS)

Information Security Challenges in E- Enterprises : Introduction , Security Threats and Vulnerabilities , Controlling Security Threats and Vulnerabilities , Managing Security threat in E – Business, Disaster Management , MIS and security challenges

Recommended Books :

1. Tripathy PC And Reddy PN, “Principles of Management”, Tata McGraw-Hill
2. B. P. Singh and T. N. Chabra , Management Concepts and Practices , Dhanpat Rai
3. W. S. Jawedkar: Management Information Systems, Tata McGraw-Hill
4. K. C. Laudon and J. P. Laudon, Management Information Systems, PHI

Paper-III(MCA-403/CS-17):Network Management and Information Security

UNIT - I

Security and Cryptographic algorithm: Need for security, principle of security, types of attacks. Cryptographic techniques : cryptography terminology, substitution techniques, transposition techniques, Symmetric and asymmetric key algorithm, possible types of attack, key range, steganography. symmetric vs asymmetric, algorithm types and modes, DES, double and triple DES, AES, comparison of various cryptographic algorithm, requirement of good cryptographic algorithm.

UNIT - II

Asymmetric cryptographic algorithm and Message Authentication: Public key cryptography principles and algorithms, RSA algorithm, Diffe-Hellman key exchange. One way hash functions, message digest, MD5, SHA1, message authentication code, Digital envelope, Digital signatures.

UNIT - III

Network Management: Management Standards and Models, configuration management, configuration database and reports, fault management, identification and isolation, protecting sensitive information, host and user authentication, structure of management information, Standard management information base, SNPv1 protocol, acounting management, performance management, network usage, matrics and quotas.

Network security: Overview of IPV4: OSI model, maximum transfer unit, IP, TCP, UDP, ICMP, ARP, RARP and DNS, ping, traceroute. Network attacks: Buffer overflow, IP scheduling, TCP session hijacking, sequence guessing. Network scanning: ICMP, TCP sweeps, basic port scans. Denial of service attacks: SYN flood, teardrop attacks, land, smurf attacks. Visual and private network topology: tunneling, IPSEC. Traffic protocols: authentication headers, ESP internet key exchange, security association PPTP, L2TP.

UNIT - IV

Web Security and Application Security: Web servers and browsers: security features, server privileges, active pages, scripting, security configuration setting for browsers, security of active content: JAVA, JAVA script, Active x, plug-ins, cookies. SSL & SET, security mail: PEM and PGP.

Firewalls: Firewall characteristics & design principles, types of firewalls, packet filtering router, application level gateway or proxy, content filters, bastion host. Firewall architectures: dual homed host, screening router, screened host, screened suvnet. Firewall logs.

UNIT - V

Instruction detection system: component of an IDS, placement of IDS components, types of IDS: network based IDS, file integrity checkers, host based IDS, IDS evaluation parameters.

Recommended book: William Stallings: Network Security Essentials

Paper -V(MCA-404/CS-18):Computer Graphics

UNIT-1

Geometry and Line generation: Lines, Line segments and perpendicular lines, distance between a point and a line, vectors, pixels, frame buffers, vector generation, Bresenham's algorithm, anti-aliasing of line, thick line segments, character generation, display the frame buffer.

Graphics Primitives: Display devices, primitive operations, Display file interpreter, Normalized device co-ordinates, Display file structure and display file algorithms, Display control, text, Line style primitives.

UNIT-2

Polygons: Polygon representation, Entering polygons, Polygon interfacing algorithms, filling polygons, filling with a pattern, Initialization, Antialiasing.

Segments: Creation of segment, Closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

UNIT-3

2D and 3D Transformations: Matrices, Scaling transformations, Rotation, Homogeneous co-ordinates and Translations, Co-ordinate transformations, Rotation about an arbitrary point, Inverse transformations, Transformation routines, Transformation and patterns, Initialization, Display procedures. 3D geometry, 3D primitives and transformations.

UNIT-4

Windowing and Clipping: The viewing transformation and its implementation, Clipping, Cohen Sutherland Outcode algorithm, Clipping of polygons, generalized clipping, Multiple windowing, Parallel projection, Viewing projections and special projections, Conversion to view plane co-ordinates, Clipping in three dimensions, Clipping planes.

UNIT-5

Hidden surfaces and Lines: Back-face algorithm, Z-buffers, Scan line algorithm, Franklin algorithm, Illumination, Transparency, Reflection, Shadows, Ray tracing, halftones, Color Models

Text/Recommended Books:

1. Steven Harrington:- Computer Graphics: A programming Approach

Paper- V(MCA-405/CS-19):Client Server Computing

UNIT-1

Overview: definition, history, myths, transition to client server computing, database architectures, advantages and disadvantages of client server architecture.

Components : client, server, network, role and services of client-server, selection of operating system as client & server, types of client & servers, connectivity, peer-to-peer communication

Middle-ware : definition, role, 2 tier v/s 3 tiers, network file system, network operating system, API, RPC model & implementation

UNIT-2

Communication in client-server: Using OSI layer, TCP/IP networks.

Client/Server processing and application development: transaction processing, remote processing, distributed processing, distributed databases, development tools

UNIT-3

Distributed Objects: CORBA architecture and services, COM, DCOM, Java-RMI

Database Drivers: ODBC driver, JDBC driver.

Linking and Embedding: OLE and DDE

UNIT-4

Data warehousing: operational data & analytical data, characteristics, architecture, Data warehouse options.

Oracle as database server: Memory architecture, Process architecture

Introduction to PL/SQL Programming: Data types, Control statements, cursors, triggers, exception handling, procedure and functions

UNIT-5

Managing C/S Applications: network management, database backup, database recovery, Data integrity, Data security.

Latest technology and tools used for Client Server Computing

Text/Reference books:

1. Client server Computing: Patrick Smith
2. Client Server survival guide, 3 rd Edition : Robert Orfali
3. Client server unleashed

Paper- VI(MCA-406) :Practical - I Graphics Lab

Practical based on paper IV

Paper - VII (MCA-407):Practical - II Client Server Computing Lab.

Practical based on paper V

Socket Network Programming, implementation of XML web services.

SEMESTER – V

Paper -I(MCA-501/CS-20):Software Engineering

Unit I

Software Engineering Fundamentals: Definition of Software, Software characteristics, Software Applications.

Software Process: Software Process Models - Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.

Project management Concepts: The Management Spectrum - The People , The Product , The Process , The Project.

Unit II

Software Process and Project Metrics : Measures , Metrics and Indicators , Software measurement : Size - Oriented Metrics , Function - Oriented Metrics , Extended Function point metrics

Software Project Planning : Project Planning Objectives , Software Project Estimation , Decomposition Techniques - Problem Based Estimation , Process Based Estimation ,Empirical Estimation Models- The COCOMO Model

Risk Analysis and Management: Software risks, Risk identification, Risk Projection, Risk Refinement, Risk Mitigation , Monitoring and Management.

Unit III

Software Quality Assurance: Basic concepts- Quality, Quality Control, Quality Assurance, Cost of Quality , Software Quality Assurance (SQA) , Formal Technical Review

Software Configuration Management: Baselines , Software Configuration Items, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.

Analysis Concepts and Principles: Requirements Elicitation for Software **,**Analysis Principles **-** The Information Domain, Modeling, Partitioning, Essential and Implementation

Views, Specification: Specification Principles, Representation, The Software Requirement Specification (SRS)

Unit IV

Design Concepts and Principles: Design Principles , Design Concepts – Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding , Effective Modular Design- Cohesion , Coupling

Software Testing: Testing Objectives & principles, Unit Testing, Integration Testing (Top Down Integration , Bottom Up Integration , Regression Testing, Smoke Testing), Validation Testing (Alpha and Beta Testing), System Testing (Recovery Testing, Security Testing, Stress Testing, Performance Testing).

Unit V

Reengineering: Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

CASE Tools: What is CASE, Building Blocks of CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.

Recommended Books:

1. R. Pressman: Software Engineering, McGraw-Hill.
2. K.K. Agrawal and Y. Sing: Software Engineering, New Age International.
3. P. Jalote: Software Project Management in Practice, Pearson.

Paper-II (MCA-502/CS-21):Modeling and Simulation

UNIT - I

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

UNIT - II

System simulation, why to simulate and when to simulate? Basic nature of simulation, techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, Monte Carlo method and its applications, distributed Lag models, cobweb model.

UNIT - III

Simulation of continuous systems, analog v/s digital simulation, single server queuing system and an inventory problem. discrete system simulation, Fixed time-step vs. even-to-event model, random number generators - Linear congruential generator, mid square Method, multiplicative congruential generator, rejection Method, testing of random Numbers .

UNIT - IV

System dynamics, exponential growth models, exponential decay model, modified exponential growth model, logistic model, generalization of growth models, system dynamics diagrams. simulation of queuing systems : queuing disciplines, notation, simulation of single and two server, performance measure of single server. simulation of PERT networks, network model of a project, analysis of activity network, critical path computation – labeling and time estimate method, uncertainties in activity duration, simulation of activity network.

UNIT - V

Introduction to GPSS : Creating and moving transactions, conditional transfers, program control statements, queues, facilities and storages, gathering statistics, priorities and parameters, standard numerical attributes, functions, solutions of problems based on GPSS.

Recommended books : System simulation - Gorden G

System simulation with digital computer - Narsing Deo

Paper-IV(1) (MCA-531/CS-24):Artificial Intelligence

UNIT-I

General Issues and Overview of AI: The AI problems, what is an AI technique?

Problem Solving, Search and Control Strategies: General problem solving, production systems, control strategies: Forward and backward chaining. Exhaustive searches: Depth and Breadth first search.

UNIT-II

Heuristic Search Techniques: Hill climbing, Branch and Bound technique, Best first search & A* algorithm, AND/ OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems, means ends analysis.

Knowledge Representation: First order predicate calculus, skolemization, resolution principle & unification, interface mechanism, Horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. Prolog unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates.

UNIT-IV

Natural Language Processing: Parsing techniques, context-free grammar, Case and Logic grammars, Semantic Analysis.

Planning: Overview- An Example Domain: The block word, component of planning systems, goal stack planning (linear planning), non-linear planning using goal sets.

UNIT-V

Handling Uncertainty: Probability theory, Bayes theorem and Bayesian networks, Certainty factor, Fuzzy Logic.

Expert Systems: Introduction to expert system, knowledge acquisition, case studies: MYCIN.

Recommended Books:

1. Elaine Rich and Kelvin Knight: Artificial Intelligence, Tata McGraw Hill.
2. D.W.Patterson: Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.
3. Clocksin, W.F and Mellish, C.S: Programming in PROLOG, Narosha Publishing

Paper III (2) (MCA-532/CS-23):Bio-Informatics

UNIT-I

Introduction to computational biology and bioinformatics: Computational biology, bioinformatics , Basic molecular biology, Understanding DNA, RNA and Protein, Genomes, genes, genomics, genetics, and proteomics, protein structures and functions , representation of molecular and protein structures, modelling of biochemcal systems, Major computational methods and computing in bioinformatics Computational environment of bioinformatics: High performance computing system, Web and Internet distributed systems.

UNIT-II

Databases for bioinformatics: NIH Gene Banks and other genrome data banks, Commonly used software in genomic analysis, Interfaces for Bioinformatics programs SeqWeb: a Web interface to GCG, SeqLab: an X-Windows interface to GCG , Integration of GCG with other UNIX programs, scripts, etc.Other Web-based Bioinformatics platforms (free and commercial)

UNIT-III

Computing in Bioinformatics:

Sequences: Sequence analysis: Alignment via dynamic programming, multiple sequence alignments and consensus patterns, scoring schemes and matching statistics, Secondary Structure, TM-helices

UNIT-IV

Stucture: Basic Protein Geometry and Least-Squares Fitting, Calculation of Volume and Surface ,Structural Alignment , Molecular Dynamics & Monte Carlo Methods

UNIT-V

Database: Protein Domains and Modules Clustering and Trees Large-scale Censuses and Genome Comparisons

Suggested Books:

1. B. Bergeron: Bioinformatics Computing, Pearson Education.
2. D.E. Krane and M.L. Paymer: Fundamental Concepts of Bio-informatics, Pearson Education.

Paper III (3) (MCA-533/CS-29): Object Oriented Modeling and Design

UNIT-I

Modeling Concepts :

The Object Oriented Paradigm : What is Object Orientation? , What is Object Oriented Development? , The Object Oriented Themes, The Object modeling Technique (OMT).

Object Modeling, Objects and Classes, Links and Associations, Advanced Links and Associations Concepts, Generalization and Inheritance, Grouping Constructs,

Advanced Object Modeling: Aggregation, Abstract and Concrete Classes,

Generalization as Extension and Restriction, Multiple Inheritance, Metadata, Candidate Keys.

UNIT-II

Dynamic Modeling: Events and States, Operations, Nested State Diagrams, Concurrency of States, Advanced Dynamic Modeling Concepts

Functional Modeling: Functional Models, the Data Flow Diagrams (DFD), Specifying Operations, Constraints, Relation of Functional to Object and Dynamic models.

UNIT-III

Design Methodology:

Analysis : Overview of Analysis , Problem Statement, Object Modeling , Dynamic Modeling , Functional Modeling , Adding Operations , Iterating Analysis, Recording Analysis.

System Design: Overview of System Design, Breaking System into Subsystems, Identifying Concurrency; Allocating Subsystems to Processors and Tasks, Managing Data Stores, Handling Global Resources, Choosing Software Control Implementation, Handling Boundary Conditions, Setting Trade-Off Priorities, Common Architectural Frameworks

UNIT IV

Object Design : Overview of Object Design, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representations, Physical Packaging, Documenting Design Decisions.

Comparison of Methodologies : Structured Analysis / Structured Design (SA/SD) , Jackson Structured Development (JSD)

UNIT V

Implementation: Implementation using a Programming Language, Implementation using a Database System, Implementation outside a Computer

Unified Modeling Language: Overview of UML, A Conceptual Model of UML , UML Diagrams : Overview , Component Diagram , Deployment Diagram, Use Case Diagrams, Collaboration Diagrams, Activity Diagrams,

Recommended Books:

1. Object Oriented Modeling and Design; James Rumbaugh, Michael Blaha, Pearson Education
2. The Unified Modeling Language User Guide , Grady Booch, James Rumbaugh, Ivar Jacobson

Paper -IV(1) (MCA-541/CS-20): DATA MINING

UNIT-I

Introduction to data mining: Basic data mining tasks, Data mining versus knowledge discovery in database, data mining issues and matrices, practical applications of data mining.

Basic concepts: Database/OLTP systems, Fuzzy sets and Fuzzy logic, information retrieval, Decision support systems, Dimensional modeling, Data warehousing, OLAP, Web search engines, Statistics, Machine learning, pattern matching.

UNIT-II

Data mining techniques: Statistical perspective on data mining, similarity measurements, decision trees, neural networks, and Genetic algorithms.

Classification: Issues in classification, Statistical based algorithms, distance based algorithms, decision tree based algorithms, neural network based algorithms, and rule based algorithms, combining techniques.

UNIT-III

Clustering: Similarity and distance measures, outliers, hierarchical algorithms: Agglomerative and divisive algorithms, partitional algorithms: Minimum spanning tree, Squared error clustering, K-Means clustering, Nearest neighbour, PAM, Bond energy, clustering with genetic, clustering with neural networks.

Clustering large databases: BRCH, DBSCAN, CURE, clustering with categorical attributes, comparison.

UNIT-IV

Association Rules:

Large item sets, basic algorithms: Apriority algorithms, sampling algorithm, partitioning, parallel and distributed algorithms: Data parallelism and Task parallelism, comparing approaches, incremental rules, Advanced association rule techniques: Generalized Association rules, Multiple level, Quantitative association rules, Using Multiple minimum

supports, Correlation rules, Measuring the quality of rules.

Web Mining:

Web content mining: Crawlers, Harvest system, Virtual Web view, personalization, Web structure mining: Page Rank, Clever, Web usage mining: Preprocessing, data structures, pattern discovery, pattern analysis.

UNIT-V

Spatial Mining:

Spatial data Overview: Spatial Queries, Spatial Data Structures, Thematic maps, and Image databases. Spatial data mining primitives, Generalization and Specialization: Progressive refinement, Generalization, Nearest Neighbour, STING Spatial rules, spatial classification algorithm:ID3 extension and Spatial Decision tree. Spatial clustering Algorithms: CLARANS, SD (CLARANS), DBCLASD, BANG, Wave cluster.

Temporal Mining:

Modeling Temporal Events, Time series: Time series analysis, Trend Analysis, Transformation, Similarity, Prediction, Pattern Detection, introductory concepts of Sequences and, Temporal association rules.

Introduction to data mining software.

Text Book: Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson Education 2003.

Paper -IV(2) (MCA-542/CS-20):Advanced Java Programming

UNIT-1

J2EE Platform: Enterprise architecture style(2 tier, 3 tier, N tier), J2EE run time, J2EE APIs, J2EE technology, web components, EJB, Developing J2EE applications.

Database Programming with JDBC: Database drivers, java.sql package, javax.sql package, connection pooling, distributed transactions, RowSet operations.

UNIT-2

Servlet Programming: Servlet implementation, Servlet configuration, Servlet life cycle, Requests and Responses, Servlet Session, HTTP protocol, Web Containers and Web applications.

Directory Services and JNDI: Naming and directory services, using JNDI, JNDI service providers, Java and LDAP, LDAP operations.

UNIT-3

Distributed Computing using RMI: RMI architecture, RMI exceptions, developing applications with RMI, parameter passing in RMI, custom sockets and SSL.

Mail protocols: SMTP, POP3, IMAP, MIME, JavaMail overview, JavaMail API, working with mail (reading a mail, sending a mail, deleting a mail, working with attachments).

UNIT-4

JSP Basics and Architecture: JSP directives, Scripting elements, Standard actions, implicit objects, JSP tags, Tag Library, Tag Handlers

UNIT-5

EJB Architecture and Design: What are EJBs, EJB Components, Session beans, Entity beans, Message Driven beans, Life Cycle of Beans, EJB container and its services, working with EJB, design of the EJB tier

Suggested Book:

1. S. Allamaraju and C. Buest: Professional Java Server Programming J2EE 1.3 Editions, SPD.

Paper -IV(3) (MCA-543/CS-30): MULTIMEDIA AND WEB DESIGN

UNIT-1

Fundamental concepts in Text and Image: Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Animation

Color in image and video: color science, color models in images, color models in video.

Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

UNIT-2

Multimedia data compression: Lossless compression algorithm- Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image

Compression, Lossy compression algorithm Quantization, Transform Coding, Wavelet-Based Coding

Basic Video Compression Techniques: Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG, Basic Audio Compression Techniques.

Multimedia Networks: Basics of Multimedia Networks, Multimedia Network Communications and Application, Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks,

Transport of MPEG-4, Media-on-Demand (MOD).

UNIT-3

Web Designing Tools: HTML tags, lists, tables, Frames, Forms, using images in web pages, DHTML-Object Model and Collections, Event Model, Data Binding with tabular data control, CSS, XML - XML and CSS, using XML data source object, XML namespaces, writing simple Style Sheets using XSLT

UNIT-4

Scripting Languages: VB script**-**Introduction in VB Script, Data types, operators, control structures, functions and strings, JavaScript-Introduction to java script, Operators, identifiers, control structures, functions, arrays and error handling, objects.

UNIT-5

Server programming: Introduction to ASP, Writing simple ASP Pages, request and response objects, file inclusion, Tracking users, Application and Session object, sessions, error handling. JSP Overview, implicit objects, Standard Actions, Introduction to PHP, PERL

Text/Reference books:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI/Pearson Education.
2. Internet and World Wide Web, H.M. Deitel, P.J. Deitel, A.B. Goldberg Pearson Education.

Paper -V(1) (MCA-551/CS-26):Embedded System Design

Unit I Overview and General Purpose Processor

Overview: Overview of embedded systems, Design challenges, common design metrics, processor technologies: general purpose processors, single-purpose processors, application specific instruction set processors, IC technologies- full custom/VLSI, semicustom ASIC, PLD , Design Technologies- compilation/ synthesis, libraries/ IP, test/ verification.

General-Purpose Processors: Basic architecture, datapath, control unit, memory, operation, instruction execution, pipelining, superscalar and VLIW architectures, programmers view, instruction set, program and memory data space, registers, I/O, interrupts, development environment, design flow and tools, debugging and testing, selecting a microprocessor.

Unit II Custom Processors

Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors.

Standard single-purpose processors: peripherals Timers, counters, watchdog timers, UART, Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks.

Unit III Application Specific Instruction Set Processors

Application Specific Instruction Set Processor (ASIP) Design: ASIP Design methodologies, steps involved in ASIP design: application analysis, design space exploration, generation of software tools like compiler, debugger, instruction set simulator etc., synthesizing processor. Simulation based and scheduler based design space exploration techniques and their comparison.

Unit IV Memory and Interfacing

Memory: Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit.

Interfacing: Arbitration, Muti-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USAB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrdA, Bluetooth, IEEE802.11.

Unit V Case Study

Case study of embedded system (Digital Camera): Introduction to a simple digital camera- user's perspective and designer's perspective, requirements specification- non functional requirements, informal functional specification, refined functional specification. Design alternatives- microcontroller alone, microcontroller and CCDPP, microcontroller and CCDPP/ Fixed-Point DCT, microcontroller and CCDPP/DCT.

Text Book:

1. Frank Vahid & Tony Givargi s: Embedded system design: A unified hardware/software Introduction, John Wiley & Sons Inc. 2002.

Paper -V(2) (MCA-552:CS-31): Information security and cryptography

UNIT – I

Overview of cryptography : Need of security, cryptographic goals, security approaches, basic terminology and concepts, symmetric key encryption - block cipher and stream cipher, substitution cipher and transposition ciphers, key space, public key cryptography, symmetric key v/s public key cryptography. Protocols and mechanisms, key management through symmetric key and public key techniques, attacks on encryption schemes, attacks on protocols, models for evaluating security, perspective for computational security.

UNIT - II

Pseudorandom bits and sequences : Random bit generation – hardware based generator and software based generator, tests for measuring randomness – frequency, serial, poker, runs and autocorrelation test. Blum-Blum-Shub pseudorandom bit generator.

Stream ciphers: Classification, one time pad, properties of synchronous and self-synchronizing stream cipher, linear and nonlinear feedback shift registers, stream ciphers based on LFSRs and its property, SEAL.

UNIT - III

Block ciphers : Modes of operation – ECB, CBC, CFB and OFB mode, exhaustive key search and multiple encryption, classical ciphers – transposition and substitution based ciphers, Vigenere ciphers, cryptanalysis of classical ciphers, Data Encryption Standard

algorithm, double and triple DES, IDEA, Advance encryption standard, comparison of block ciphers, differential and linear cryptanalysis.

Public key encryption : Overview of symmetric key cryptography, RSA algorithm, EIGmal encryption, Knapsack encryption algorithm. public key cryptography standard (PKCS), PKI and security.

UNIT - IV

Message and Users authentication : One way hash functions, message digest, MD5 algorithm, secure hash algorithm (SHA1), comparison between different message digest algorithm, message authentication code.

Users authentication : authentication basics, password, authentication tokens, certificate based authentication, biometric authentication, Kerberos, Single sign on approach.

Digital signature: digital envelope, classification of digital signature schemes – appendix and message recovery, attacks on signature.

UNIT - V

Key management techniques: simple key establishment models, tradeoffs among key establishing protocols, techniques for distributing confidential key, techniques for distributing public keys, comparison of techniques for distributing public keys, key management involving multiple domains, key management life cycle.

Recommended book : Applied cryptography – Menezes, Oorschot and Vanstone
Network Security Essentials - William Stallings

Paper -V(3) (MCA-553:CS-32):Image Processing

UNIT - I

Image presentation and transform : Elements of visual perception, colour representation, Image capture, representation and storage. gray level transformation, histogram equalization, multi-image operations.

Image transform : Discrete Fourier transforms (DFT), Discrete cosine transform (DCT), Walsh-Hadamard transform, Haar transform, Karhunen-Loeve transform, singular value decomposition.

UNIT - II

Image enhancement : Contrast Intensification – linear stretching, Non-linear stretching, histogram specification, modifying gray level co-occurrence matrix, smoothing – image averaging, mean filter, order statistic filter, edge preserving smoothing, low pass filtering, Image sharpening – high pass filtering, homomorphic filtering.

UNIT - III

Image restoration: Mean square error restoration, least-square error restoration, restoration by singular value decomposition, restoration by maximum a posterior estimation, restoration by homomorphic filtering – distortion model and range of parameter, filtering procedure and related problems.

UNIT - IV

Image compression: Fidelity criteria, run length coding, Huffman coding, LZW, arithmetic coding, JPEG encoder and decoder , vector quantization compression.

UNIT - V

Image segmentation : Region extraction, pixel based approach, multilevel thresholding, local thresholding, region based approach – growing, splitting, merging, split and merge techniques.

Recommended books : Digital Image processing and analysis - B. Chandra and D. Majumder

Fundamental of digital image processing - Anil K. Jain

Paper-VI (MCA-506):Practical-I Minor Project

Paper -VII(MCA-507):Practical - II ELECTIVE Lab

Practicals based on Elective Paper offered by the candidates

SEMESTER - VI

Paper - I :(MCA - 601) Project Work

Project in the semester VI examination shall carry marks for internal assessment and following grading system will be followed in the external examination conducted by the University.
Excellent / Good / Satisfactory / Unsatisfactory.

Only the projects submitted by the candidates as per following guidelines will be evaluated.
1. Project to be selected by the student at the end of fifth Semester
2. The project must be of approximately 480 man hours and so certified by the supervisor of the project
3. The project must be submitted in the form in consonance with the format enclosed
4. Monthly progress report must be submitted through supervisor in the enclosed format.
5. Project must be submitted before the prescribed last date .
6. Candidates are required to make a presentation of their project work during their project examination
7. Students whose Projects graded as unsatisfactory will given one more chance to undertake another project under another supervisor /organization.
8. The project work of the candidates whose monthly progress report is not submitted will be considered as incomplete and may be terminated within two weeks from the prescribed due date.
9. Students will be allowed to undertake project works only at the bonafide organizations.
10. Students are required to give two seminars during the project work, one at the end of 2nd month and another at the end of 4th month. However, candidates working for their project in organizations outside the state need to give only one seminar during the entire project period.
11. Examination of the project work will be conducted by a committee consisting of at least two internal examiners and one external examiner.

Guidelines for Project in partial fulfillment of the requirement of MCA course

(a) The project will consist of two parts:
- Documentation; and
- Viva-voce

(b) The source-code and the executable code have to be submitted on floppies and student must demonstrate working of the software.

(c) Project shall be original and not copied from the existing material from any source and a certificate, as per format given will be provided with the Project, duly countersigned by the supervisor.

(d) Project will be submitted only when the candidate completes all papers though he or she may start the projects earlier.

(e) Presentation of the Project will be in the accepted norms; as laid down in various text-books; IEEE standard/ ISO standards etc., are some models to follow.

(f) As far as possible, the Project should be of real life value.

(g) Though the Project is given 480 hours, the student is expected to use his/her discretion to ensure that it is large enough to be of practical value.

(h) The number of hous will not include the hours for writing and documentation of the Project.

(i) During the presentation of the Project at via-voce the candidate is advised to have a computer based or an overhead project presentation material handy.

PERFORMA FOR CERTIFICATE

This is to certify that this is a bonafied record of the Project entitled _____ was done satisfactory at _____ by Mr./Ms _____ in partial fulfillment of MCA course. He/ She has successfully completed all the subjects.

This report had not been submitted for any other examination and does not form part of any other course undergone by the candidate.

PLACE:

DATE: SIGNATURE

NAME:
DESIGNATION:

(Name & Seal of organization of Supervisor)

PROFORMA FOR THE PROJECT REPORT

1. Title of the Project
2. Objectives
3. Input to the Project
4. Output generated
5. Details of Hardware Platform used
6. Details of Software Tools used
7. Implementation Issues (Clearly defining the area of Application).
8. Miscellaneous
9. Signature of the Candidature.

GUIDELINES FOR THE CHAPTERS AND SECTIONS

1. Microscopic Summary

2. Details of candidate and Supervisor along with certificates of :
    - Original Work;
    - Assistance if any;
    - Credits.
3. Aims and Objectives
4. Approach to Project and Time Frame
5. Project Design Description with Appendices to cover:
    - Flow Charts/Data Flow Diagram-Macro/Micro level
    - Source Code
    - Hardware Platform
    - Software Tools
    - Security measures
    - Quality Assurance
    - Auditability

6. Test Data and Result.