Rajasthan Technical University, Kota
FACULTY OF COMPUTER APPLICATIONS

Master of Computer Applications
SYLLABUS
Session 2016-17

MCA Year 1 Semester I								
S.No.	**COURSE CODE**	**SUBJECT**	**PERIODS**			**INTERNAL ASSESMENT**	**ESE**	**Subject TOTAL**
			L	**T**	**P**			
1	MCA-101	Discrete Mathematics	3	1		20	80	100
2	MCA-102	Programming in C & C++	3	1		20	80	100
3	MCA-103	Operating System	3	1		20	80	100
4	MCA-104	Computer Architecture	3	1		20	80	100
5	MCA-105	Accounting and Financial Management	3	1		20	80	100
Practicals								
1	MCA-151	Office management Lab			4	20	80	100
2	MCA-152	C & C++ Lab			4	20	80	100
3	MCA-153	Communication Skills			4	20	80	100
4	MCA-154	Microprocessor Lab			4	20	80	100
		Total				**180**	**720**	**900**

Discrete Mathematics

Class: I Sem. MCA **Evaluation**
Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Content of the Subject

Introduction to Discrete Mathematical Structures : Sets, Relations and functions- Sets, Types of Sets, Multisets, Operations on Sets, Relations and Properties of Relations, Representation of Relations, Equivalence Relation, Closures of Relations, Functions ,injection, Surjection and Bijective mapping, Composition of functions, Introduction to characteristic functions.

Methods of Proof Direct Proofs, Indirect Proofs, Mathematical Induction, Method of Contradiction.

Permutations and Combinations, Pigeon Hole Principle, Principle of Inclusion and Exclusion, Sequence and Series, Generating Functions.

Mathematical Logic Proposition and Propositional Calculus Posets and Lattices: Partial Order Set, Bounding Elements, Well Ordered Set, Topological Sorting, Lattices, Principle of Duality, Bounded, Distributed, and Complemented Lattices

Graph Theory: Types of Graphs, Path and Circuits, Eulerian Path and Circuits, Hamiltonian Path and Circuits, Shortest Path Algorithms

Group: Definitions and Properties, Coset & Subgroup, Normal subgroup, Homomorphism of groups, Cyclic Group, Permutation Group. Matrix Algebra: Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigenvectors-Inverse of a Matrix - Cayley Hamilton Theorem

Text Book:

1. Keneth H. Rosen, "Discrete Mathematics and Its Applications", TMH, 2012

References:

1. C L Liu, "Elements of Discrete Mathematics", TMH, 2012.
2. Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI, 2015.
3. Narsingh Deo, "Graph Theory With Application to Engineering and Computer Science', PHI, 1979

Programming in C and C++

Class: I Sem. MCA **Evaluation**
Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Content of the Subject

Programming fundamentals through C: Algorithms and Flowcharts, Data types, constants, variables, operators, data input and output, assignment statements, conditional statements, expressions, string and character handling, data validation examples. Iteration, arrays, strings processing. Defining function, function prototype, passing parameters, recursion.

Pointers: Definition and uses of pointers, pointer arithmetic, pointers and array, pointers and functions, pointer to pointer. Structures, union, pointers to structures, user-defined data types, enumeration.

Introduction to Dynamic Memory Allocation, command line arguments, systems calls.
File Handling in C

OOP Paradigm: Characteristics of OOP, Comparison between functional programming and OOP approach, characteristics of object oriented language - objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.

Introduction to C++, Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output, conditional expression loop statements, break control statements.. Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors

Inline member functions, static class member, friend functions, and dynamic memory allocation.

Polymorphism and Inheritance: Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions.

Single inheritance, types of inheritance, types of base classes, types of derivation, multiple inheritances, container classes, member access control.

Exceptions and Templates: Exception syntax, Multiple Exceptions, Function templates, function templates with multiple argument templates. File Handling in C++

Text Book:

1. E Balagurusamy, "Object oriented Programming with C++", Tata McGraw Hill, 2006
2. Kamthane, A.N., "Programming with ANSI and Turbo C", Pearson Education, Delhi, 2006

References

1. Deitel and Deitel "C How to Program", Pearson Education. 2010
2. Yashavant Kanetkar "Understanding Pointers in C", BPB Publications, 2008
3. Reams Thareja, "Programming in C" Oxford University Press, 2011
4. HM Deitel and PJ Deitel "C++ How to Program", Prentice Hall, 2010
5. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Pearson Education, 2003.

Operating system

Class: I Sem. MCA **Evaluation**
Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Content of the Subject

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

Process Management : Process concept, Process scheduling, Cooperating process, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling and Algorithm evaluation.

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

Storage Management: Memory Management –Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing , Page Size and other considerations.

Protection and Security: Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, Language based protection, The security problem, authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

File system and secondary storage structure : file concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk-scheduling methods, Disk management, Recovery , Swap-space management, Dist reliability.

Case Study: Windows NT-Design principles, system components Environmental Subsystems, File system, Networking and program interface.

Text Book:

1. Abraham Silberschatz, Peter B Galvin and G. Gagne, "Operating System Concepts", Addision Wesley Publishing Co. , 2010

References:

1. Andrew S.Tanenbaum, "Modern Operating System", PHI Learing Pvt. Ltd., 2008
2. William Stallings, "Operating Systems : Internal and design Principles", Prentice Hall, 2011
3. H.M. Deital, PJ Deital and DR Chorffnes, "Operating System", Pearson Education, 2011

Computer Architecture

Class: I Sem. MCA **Evaluation**
Branch: MCA
Schedule per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

Basic Building Blocks: Gates, Boolean Functions and Expressions Designing Gate Networks, K-map simplification, Useful Combinational Parts, Programmable Combinational Parts, Timing and Control, Latches, Flip-flops, Registers and Counters, Sequential Circuits.

Arithmetic/Logic Unit: Numbers Representation, Arithmetic Operations, Floating-Point Arithmetic.

Register Transfer Language and Micro-operations: Concept of bus, data movement among registers, a language to represent conditional data transfer, data movement from/ to memory. Design of Arithmetic & Logic Unit and Control Unit Control design hardwired control, micro programmed arithmetic and logical operations along with register transfer, timing in register.

Instruction and Addressing: A simple computer organization and instruction set, instruction formats, addressing modes, instruction cycle, instruction execution in terms of microinstructions, interrupt cycle, concepts of interrupt and simple I/O organization, Synchronous & Asynchronous data transfer, Data Transfer Mode: Program Controlled, Interrupt driven, DMA(Direct Memory Access). Implementation of processor using the building blocks.

Memory System Design: Memory Origination, Memory Hierarchy, Main Memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache Memory, Virtual Memory.

Assembly Language Programs, Assembler Directives, Pseudo Instructions, Macroinstructions, Linking and Loading.

Vector and Array Processing: Shared-Memory, Multiprocessing, Distributed Mufti Computing.

Microprocessor Concepts: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.

Text Book:

1. M. Morris Mano "Computer System Architecture" Prentice Hall , 2007

References:

1. William Stallings, "Computer Organization & Architecture-Designing for Performance" , 2012
2. John P~ Hayes, "Computer Architecture and Organization" , Tata McGraw Hill, 1998.
3. Svetlana N.Yanushkevich, Vlad P.Shmerko, "Introduction to Logic Design", CRC Press, 2012.

Accounting and Financial Management

Class: I Sem. MCA **Evaluation**
Branch: MCA
Schedule per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

Introduction to Accounting: Definition of Accounting and its advantages & limitations, Scope of accounting. Branches of Accounting - Financial Accounting - Cost Accounting - Management Accounting, users of Accounting information, Methods of Accounting, Double Entry Accounting System

Types of Accounts and Rules for Debit and Credit Preparation of Journal, Ledger and Trial Balance

Final Accounts: Preparation of Final Accounts (Sole Proprietorship only), Preparation of Trading A/c, Profit & Loss A/c and Balance Sheet covering simple adjustments.

Accounting Ratios: Meaning, Advantages and Limitations of Accounting ratios, Computation of profitability, liquidity, solvency, and turnover ratios.

Cost Accounting: Meaning and definition of Cost Accounting – its Advantages & Limitations

Marginal Costing: Meaning-Advantages- Limitations, Break Even Point, Margin of Safety, Profit Volume Ratio

Introduction to Financial Management: Meaning of financial management, functions and objectives of financial management- Profit Maximization and wealth maximization, basic finance decisions, changing role of finance.

Text Books:

1. S.N. Maheswari, & S.K. Maheshwari, "Advanced Management Accounting", Vikas Publishing House, 2010
2. M.Y. Khan and P.K. Jain, "Management Accounting", Tata McGraw Hill, 2009
3. M Y. Khan and P.K. Jain , "Cost Accounting", Tata McGraw Hill, 2008

References:

1. Vijay Kumar , "Accounting for Management", Tata McGraw Hill, 2015
2. Anthony, N. Robert, Hawkins and Merchant ,"Accounting: Text and Cases(SIB)", McGraw Hill, 2013
3. Weston, John. Fred. Thomas, E.Copeland , "Managerial finance", Dryden press, 1988

Office Management Lab

Class: I Sem. MCA

Evaluation

Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

MS word Basics: Introduction to MSWord; Features & area of use. Working with MS Word. Menus & Commands, Toolbars & Buttons, Shortcut Menus, Wizards & Templates. Creating a New Document; Different Page Views and layouts; Applying various Text enhancements. Working with Styles, Text Attributes; Paragraph and Page Formatting; Text Editing using various features; Bullets, Numbering, Auto formatting, Printing & various print options.

Advanced Features of MS-Word: Spell Check, Thesaurus, Find & Replace; Headers & Footers

Inserting - Page Numbers, Pictures, Files, Auto texts, Symbols etc., Working with Columns, Tabs & indents; Creation & Working with Tables including conversion to and from text; Margins & Space management in Document; Adding References and Graphics; Mail Merge, Envelops & Mailing Labels.

MS Excel: Introduction and area of use; Working with MS Excel., concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options

MS PowerPoint: Introduction & area of use; Working with MS PowerPoint; Creating a New Presentation; Working with Presentation; Using Wizards; Slides & its different views; Inserting, Deleting and Copying of Slides; Working with Notes, Handouts, Columns & Lists; Adding Graphics, Sounds and Movies to a Slide; Working with PowerPoint Objects; Designing & Presentation of a Slide Show; Printing Presentations

MS Access: Define data needs and types ,define and print table relationships, Add, set, change or remove primary keys Split databases Create databases Create tables Modify tables Enter records using datasheet view, Delete records from a table Change records in a table Create fields and modify field properties Create reports Modify the design of reports and forms.

Computerized Accounting : Use of Accounting Software Tally, Creation Company, Voucher Entry, Types of accounts, Mode of accounting (Day cash book, ledger book, bank reconciliation, Ledgers, Trial balance, Balance Sheet) Analysis of Trial Balance and Final Accounts

C & C++ Lab

Class: I Sem. MCA

Evaluation

Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

Control Statements:-Programs on if-else ladder, iterative statements, Functions and recursions, predefined functions.

Pointer and Dynamic Memory:-Programs on Arrays, sorting (Bubble, selection, insertion) Searching (linear, Binary), 2D Array (Matrix operations), Pointers, Structures, union, enum, Dynamic Memory allocation

Programs on File Handling, Programs on Command Line Arguments.

Objects, Functions and Constructor:- Programs on classes and objects constructors, functions , inline functions, Friend function.

Polymorphism:-Programs on Function Overloading, overriding, Operator overloading, programs on different type of inheritances, virtual function.

Exception Handling and File Handling:- Programs on input/output Streams, Exception Handling, File Handling ,Template Classes.

Communication Skills

Class: I Sem. MCA

Evaluation

Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

Listening and Speaking Skills: Conversational Skills Formal and Informal Conversation

listening to lectures, discussions, talk shows, news programs.

Writing Skills: Formal & Informal writings, report writing, Creative writing seminar, paper, bibliography.

Composition: Resume Writing, Business Letter Writing: Complaint, Job Applications and official correspondence; E-mail messages.

Presentation Skills: Elements of effective presentation, structure of presentation, voice modulation, audience analysis, body language, eye contact, sample videos. Debates, Seminar, Speeches, Lectures. Interviews, mock interviews.

Group Discussion: Structure of GD, Moderator led and other ODs, Strategies in GD, team work body language, mock GD

Microprocessor Lab

Class: I Sem. MCA **Evaluation**
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]
Contents of the Subject

Storage Of Data: Implementation of programs related to storage of data in memory, exchange of memory content, addition and subtraction of 8 bit numbers and 16 bit numbers. Finding largest and smallest from given numbers

One's Complement and Two's Complement: Implementation of program for one's complement and two's complement, right shift and left shift of 16 bit data, multiplication and division of two 8 bit numbers. Calculation of factorial and square of a number. Implementation of program for calculation of sum of series of numbers sum of series of even numbers, sum of series of odd numbers.

Data Transfer: Data transfer from one memory block to other in same and reverse order

Array: Implementation of programs to search a number in array, arrangement in ascending and descending order

Conversion Programs: Implementation of program for addition, subtraction of two BCD numbers, BCD to binary and binary to BCD conversion HEX to decimal and HEX to binary conversion

MCA Year 1 Semester I I								
S.No.	COURSE CODE	SUBJECT	PERIODS			INTERNAL ASSESMENT	ESE	Subject TOTAL
			L	T	P			
1	MCA-201	Computer Oriented Numerical and Methods	3	1		20	80	100
2	MCA-202	Data Communication and Computer Networks	3	1		20	80	100
3	MCA-203	Data Structures	3	1		20	80	100
4	MCA-204	Database Management System	3	1		20	80	100
5	MCA-205	System Analysis and Design	3	1		20	80	100
Practicals								
1	MCA-251	Data Structure Lab			4	20	80	100
2	MCA-252	CONM Lab			4	20	80	100
3	MCA-253	SQL Lab			4	20	80	100
4	MCA-255	Communication & Soft Skill Lab			4	20	80	100
		Total				**180**	**720**	**900**

Computer Oriented Numerical Methods

Class: II Sem. MCA

Evaluation

Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Content of the Subject

Data Representation - Floating point Arithmetic – Addition, Subtraction, Multiplication and Division operation. Pitfall of floating point representation, Errors in numerical computation Iterative Methods, Measurement of Accuracy by using Absolute Error and Relative Error

Solution of Non Linear equations- Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Method of Successive Approximation, Rate of convergence of iterative methods.

Solutions of system of Linear equations- Direct Method - Gauss Elimination method and pivoting, Ill Conditioned system of equations. Iterative method- Gauss Seidal Method.

Interpolation and approximation: Finite Differences, Difference tables, Polynomial Interpolation: Newton's forward and backward formula, Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.

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

Numerical Differentiation and Integration: Introduction, Numerical Differentiation- Differentiating a Graphical Function, Differentiating a Tabulated Function. Numerical Integration-Trapezoidal rule, Simpson's rules, Weddle's Rule Euler- Maclaurin Formula.

Curve Fitting - Curve fitting and Approximation: Method of least squares, fitting of Linear Function, fitting of Nonlinear Function- polynomials, exponential curves.

Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

Algorithm of each numerical method mentioned in Lab Syllabus

Text Books:

1. Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 2003
2. Rajaraman, V.," Computer Programming in C", Prentice Hall of India, 2004

References

1. Balaguruswami, E., "Computer Oriented Statistical and Numerical Methods", Mac. Million, 2000
2. Krishnanmurthy, E.V. &Sen, S. K., "Computer Based Numerical Algorithms", East West Press, 1984
3. Rajaraman, V.,"Computer Oriented Numerical Methods", 3rd Ed., Prentice Hall, India, 1980

Data Communication and Computer Networks

Class: II Sem. MCA **Evaluation**
Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Content of the Subject

Networking Fundamentals:
Introduction, Data & Information, Data Communication-Characteristics of Data Communication, Components of Data Communication, Data Representation, Data Flow- Simplex, Half Duplex, Full Duplex, Computer Network- Categories of a network, Protocol- Elements of a Protocol, Networking Standards, Reference Models- OSI Model, TCP/IP Model, Comparison of OSI and TCP/IP Model.

The Physical Layer
Transmission Media- Guided & Unguided, PSTN: Structure of the Telephone System, Data & Signals- Data types, Signal types- Analog & Digital, Modulation Techniques, Modem, Cable Modem, Protocols: DSL, ISDN.

The Data Link Layer

Design Issues: Framing, Error Control, Flow Control, Protocols: FDDI, CDDI, Frame Relay, ATM, 802.11, PPP, HDLC.

The Medium Access Sub-Layer
Multiple Access Protocols: ALOHA, CSMA, Ethernet: Switched Ethernet, Fast Ethernet, Gigabit Ethernet, DLL Switching: Internetworking, Repeaters, Hubs, Bridges, Switches, Routers, Gateways, Virtual LANs.

The Network Layer
Design Issues, Routing Algorithms: Link State Routing, Distance Vector Routing, Flooding, Routing Protocols: RIP, IGRP, EIGRP, OSPF, Internetworking: Tunneling, Fragmentation, IPV4, IPV6 Basics, BGP.
The Transport Layer Protocols: UDP, TCP, Headers.

The Application Layer
DNS: The DNS Name Space, Name Servers,E-Mail: SMTP, POP3, HTTP, FTP, Telnet, Network Management: SNMP.

Network Security
Cryptography: Encryption, Decryption, Private/Public Key, Digital Signatures, SSL, Firewalls, PGP, S/MIME.

Text Books:

1. Computer Networks, Andrew S.Tanenbaum, Prentice Hall, 5th Edition, October, 2010.
2. Data Comm. & Netw.5e Global Ed (English), A. BehrouzForouzan, McGraw Hill Education (India) Private Limited, 5th Edition, 2013.

References

1. Computer Networks and Internets with Internet Applications, Douglas E.Comer& M. S. Narayana, Pearson Education, 4th Edition, 2009.
2. Data Communications, Computer Networks and Open Systems, Fred Halsall, Addison Wesley, 4th Edition, 2001.
3. William Stallings, "Cryptography and Network Security: Principles and Practice" Pearson Education, 5th Edition, 2011.

Data Structures

Class: II Sem. MCA

Evaluation

Branch: MCA
Schedule Per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Introduction: Basic data structures such as arrays, linked list, stack, trees and queues and their applications, linked and sequential representation Basic Terminology, Elementary Data organization, Data Structure operations.

Queues, Stack implementation through Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation (row major and column major), Applications of arrays - Character Strings and string operations, Ordered Lists.

Stack: Implementation of stack, operations on stack. Applications of stack: Conversion of infix-expressions to prefix and postfix expressions, evaluation of postfix expression.

Queues: implementation of queues, Operations on Queue, Types of Queues - Circular queue, Deque and Priority Queue**.**

Recursion: recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion, Backtracking,, recursive algorithms, principles of recursion.

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, insertion and deletion to/from Linked Lists, insertion and deletion Algorithms, Doubly linked list, Header lists, circular lists, sorted lists.

Trees: Basic terminology and definitions. Array and Linked Representation of Binary trees, Traversing Binary trees. **Binary Search Trees**: Binary Search Tree (BST), Traversal, Insertion and Deletion in BST, and Introduction to balanced BST (AVL Trees).

Searching: Sequential search, binary search, comparison and analysis.

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

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

Text Book:

1. Abraham Silberschalz, Peter B Galvin and G. Gagne, "Operating System Concepts", Addision Wesley Publishing Co. , 2010

References:

2. Andrew S.Tanenbaum, "Modern Operating System", PHI Learing Pvt. Ltd., 2008
3. William Stallings, "Operating Systems : Internal and design Principles", Prentice Hall, 2011
4. H.M. Deital, PJ Deital and DR Chorffnes, "Operating System", Pearson Education, 2011

Database Management System

Class: II Sem. MCA **Evaluation**
Branch: MCA
Schedule per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

Introduction: Overview of DBMS, Advantages of DBMS, Basic DBMS terminology, Database System v/s File System, Data Independence, Architecture of DBMS, Introduction to data models: Relational Model, Network Model, Hierarchical Model, Entity-Relationship Model, Comparison of network, hierarchical and relational models.

Data modeling using the Entity Relationship Model: ER model concepts, Types of Relationships, notation for ER diagram, Reduction of ER-Diagrams to Relational Model, mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree

Relational model: Storage Organizations for Relations, Relational Algebra, Set Operations, Relational Calculus, Concepts of Alternate key, candidate key, primary key, Foreign key, Integrity Rules, Data Dictionary.

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

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands: DDL, DML, TCL, DCL, SQL operators, Tables, views and indexes, Constraints Group By and Having Clause, Order By Clause, Queries and sub queries, Aggregate Functions, Numeric Functions, String Functions, Date & Time Functions, Insert, Update and Delete operations, Unions, Intersection, Minus, Joins: Equi-Join, Natural Join, Self-Join, Inner Join, Outer Join

Text Books:

1. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 6th Edition, 2011
2. Korth, Silberschatz, Sudarshan, "Database Concepts", McGraw Hill, 6th Edition, 2010

References

1. Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 5th Edition, 2010
2. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill, 3rd Edition, Jan 2007
3. Date C J, "An Introduction to Database System", Addision Wesley, 8th Edition 2003
4. Bipin C. Desai, "An Introduction to Database Systems", Galgotia Publication, Revised Edition, 2010
5. Majumdar& Bhattacharya, "Database Management System", TMH, 2005
6. Paul Beynon Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003

System Analysis and Design

Class: II Sem. MCA

Evaluation

Branch: MCA
Schedule per Week
Lectures: 3
Examination Time: Three Hours Maximum Marks: 100 [Mid-term (20) & End-term (80)]

Contents of the Subject

System Concept and Information System Environment

System Concepts and Information Systems Environment: The System Concept: Definition, Characteristics of Systems, Elements of a System, Open and Closed System, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

System Development Life Cycle

System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance. Role of the Systems Analyst, The Analyst/User Interface, Behavioral issues. Case Study on SDLC.

System Planning and Information Gathering

Systems Planning and Initial Investigation: Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

Information Gathering: need, Information about the firms, Information gathering tools, Interviewing, Arranging the Interview, Guides to a Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives. Case Study on Information Gathering.

Feasibility Study and System Analysis

Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis.

Tools of Structured Analysis: The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English. Case Study on Tools.

System Design and System Security

Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, and Requirements of form Design.

H/W / S/W Selection, Make V/s Buy decision and Maintenance. Documentation: Importance, Types of documentation, Security, Disaster/ Recovery and Ethics in System Development: Threats to System Security, Control, Measures, Disaster/ recovery planning.

Text Books:

1. System Analysis & Design, Shelly Cashman Series, Thomson Press 10th Edition, 2013
2. System Analysis and Design, Kendall and Kendall, Prentice Hall, 9th Edition, 2013

References

1. Systems Analysis and Design, Howryskiewycz, PHI, 5th Edition, 2000
2. Structured System Analysis and Design, S.A Kelkar, Prentice Hall, India, 2004
3. System Analysis and Design Methods, Whitten, Bentley, 9th Edition, 2005
4. System Analysis and Design, Elias M. Awad, 2nd Edition, 2003

MCA Year 2 Semester III								
S.No.	COURSE CODE	SUBJECT	PERIODS			INTERNAL ASSESMENT	ESE	Subject TOTAL
			L	T	P			
1	MCA-301	Java Technologies	3	1		20	80	100
2	MCA-302	Web Technologies and Development	3	1		20	80	100
3	MCA-303	Computer Graphics	3	1		20	80	100
4	MCA-304	Advanced Database System	3	1		20	80	100
5	MCA-305	System Analysis and Design	3	1		20	80	100
Practicals								
1	MCA-351	Advanced Java Lab			4	20	80	100
2	MCA-352	Web Design Lab			4	20	80	100
3	MCA-353	Computer Graphics Lab			4	20	80	100
4	MCA-354	Advanced DBMS Lab (Oracle/DB2/MySQL)			4	20	80	100
		Total				**180**	**720**	**900**

1	MCA-301	Java Technologies	3	1		20	80	100

Introduction to Java Enterprise, API JDBC, fundamentals, J2EE multi-tier architecture, Web Applications in J2EE.
Servlets fundamentals – architecture, life cycle of a servlet, initialization, threads, servlets and HTML, retrieving data in servlet, servicing he GET and POST requests, servlet sessions – session tracking, cookies.
Servlets, JDBC and Inter servlet communications – JDBC, Driver types, JDBC servlet, JDBC connection pool, inter servlet communication, servlet security and different packages of JSP and servlets.
JSP fundamentals – architecture, implicit objects, standard actions, JSP errors.
J2ME – introduction, building MIDlets, creating a user interface, event handling with commands, tickers, screens, textbox, lists and forms.

Text/References:

1. David flangan, Jim Farley, W Crawford an Kris Magnusson, Java enterprise in a Nutshell, Shroff Publishers, Calcutta
2. P J Perrone, V S R Chaganti, Building Java Enterprise Systems wit J2EE, SAMS, BPB Publications

2	MCA-302	Web Technologies and Development	3	1		20	80	100

The internet: history of the world wide web, hardware and software trend, object technology – java script object, scripting for the web-browser portability.
Introduction of HTML: introduction, markup language, editing HTML : common tags, headers, text styles, linking, images, formatting text, horizontal rules and more line breaks, unordered lists, nested and ordered lists, basic HTML tables : intermediate HTML tables and formatting : basic HTML forms, more complex HTML forms, internal linking, creating and using image maps.
Java script – introduction to scripting: introduction- memory concepts- arithmetic- decision making. Java script control structures, Java script functions: introduction – program modules in

java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions.

Java script arrays: introduction, array-declaring and allocating arrays, references and reference parameters – passing arrays to functions, multiple subscripted arrays. Java script objects: introduction, math, string, data, boolean and number objects.

Dynamic HTML : CSS : introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the box model, user style sheets.

Dynamic HTML: object model and collections: introduction, object referencing, collections all and children, dynamic style, dynamic positioning, using the frames collection, navigator object.

Dynamic HTML: event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.

Filters and Transitions: Dynamical HTML: Client side scripting with VB script: Introduction - operators- data types and control structures – VB script functions – arrays –string manipulation classes and objects.

Introduction to PHP – Advantages of PHP – Functions – Data types – Arrays – SQL – Connecting Databases using ODBC – Files – Forms – Images –Imap objects.

Text/References:

1. Internet & World Wide Web How to Program, Dietel & Dietel, Pearson.
2. Web Programming, Bai wt.al, Thomson

3	MCA-303	Computer Graphics	3	1		20	80	100

Introduction: Elements of graphics workstation. Video Display Devices.Raster Scan Systems. Random Scan systems. Input devices. Graphics Software Coordinate Representations, Fundamental Problems in Geometry.

Algorithms: Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Circle and Eclipse generating algorithms. Midpoint Circle Algorithm. Sean-line polygon fill algorithm. Inside-Outside tests. Sean- Line fill of curved Boundary Areas. Boundary fill Algorithm. Flood fill Algorithm. Character generation. Attributes of lines, curves, filling, characters. etc.

Graphics Primitives: Primitive Operations, The display file interpreter-Normalized Device Coordinates. Display- File structure. Display – file algorithm. Display control and Polygons-polygon representation.

Attributes of output primitives: Line attributes - Line type. Line width. Pen and Brush options. Line Color. Color and gray scale levels. Color-tables. Gray scale. Area- Fill Attributes- Fill styles. Pattern fill. Soft fill. Character Attributes. Text attributes.

Geometric Transformations: Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Transformations Routines.

2-D Viewing- The viewing pipeline. Viewing co-ordinate, Reference Frame. Windows to view ports . co-ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen- Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

3-D concepts. Three dimensional Display Methods Parallel projection. Perspective projection. Visible line and surface identification. Surface rendering. Three Dimensional Object representations. Bezier curves and surfaces. B-Spline curves and surfaces.

Visibility , Image and object precision Z- buffer algorithm. Floating horizons.

Computer Animation: Design of Animation Sequences. General Computer Animation Functions-Raster Animations. Key Frame Systems. Morphing Simulating Accelerations. Motion Specifications. Kinematics and Dynamics.

Text/References:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: Computer Graphics- Principles and Practice, Pearson
2. Hearn and Baker: Computer Graphics, PHI.

4	MCA-304	Advanced Database System	3	1		20	80	100

Object-based Databases : Object-Oriented Databases: Object-oriented data model, Object Oriented Languages, Persistent Programming Languages. Object-Relational Databases: Nested Relations, Complex Types, Inheritance, Reference Types, Querying with Complex Types, Functions and Procedures Storage for Object Databases

Distributed Databases : Distributed Data Storage, Distributed Transactions, Commit protocol, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing

Parallel Databases : I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems

Deductive Databases : Introduction to Recursive Queries, Theoretical Foundations, Recursive Queries with Negation, From Datalog to SQL, Evaluating Recursive Queries

Information Retrieval and XML Data : Introduction to Information Retrieval, Indexing for Text Search, Web Search Engines, Managing Text in a DBMS, A Data Model for XML, Xquery, Efficient Evaluation of XML Queries.

PL/SQL basics, blocks, architecture, variables an constants, attributes, character set, PL/SQL sentence structure, data types, precompiler, conditional and sequential control statements, control structures, conditional control, sequential control, cursors, exceptions, triggers, procedures and packages.

Text/References:

1. Elmasri R and Navathe SB, Fundamentals of Database Systems, 3rd Edition, Addison Wesley, 2000.
2. Connolly T, Begg C and Strachan A, Database Systems, 2nd Edition, Addison Wesley, 1999
3. Ceri Pelagatti , Distributed Database: Principles and System - (McGraw Hill)
4. Simon AR, Strategic Database Technology: Management for the Year 2000, Morgan Kaufmann, 1995
5. Gray J and Reuter A, Transaction Processing: Concepts and Techniques, Morgan Kaufmann, 1993

5	MCA-305	System Analysis and Design	3	1		20	80	100

System Concepts and Information Systems Environment: The System Concept: Definition, Characteristics of Systems, Elements of a System, Open and Closed System, Formal and Informal Information Systems, Computer based Information Systems, Management

Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance.

Role of the Systems Analyst, The Analyst/User Interface, Behavioral issues.

Systems Planning and Initial Investigation: Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

Information Gathering: need, Information about the firms, Information gathering tools, Interviewing, Arranging the Interview, Guides to a Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

Tools of Structured Analysis: The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English.

Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis.

Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, and Requirements of form Design.

H/W / S/W Selection, Make V/s Buy decision and Maintenance, Documentation: Importance, Types of documentation, Security and disaster planning and management.

Text/References:

1. Systems Analysis and Design, Howryskiewycz, PHI
2. System Analysis & Design, Shelly Cashman Series, 4th Ed., Thomson Press
3. Analysis and Design of Information Systems, Senn, TMH
4. System Analysis and Design Methods, Whitten, Bentley
5. System Analysis and Design, Awad
6. Analysis and Design of Information Systems, Rajaraman,PHI

MCA Year 2 Semester IV								
S.No.	COURSE CODE	SUBJECT	PERIODS			INTERNAL ASSESMENT	ESE	Subject TOTAL
			L	T	P			
1	MCA-401	Software Engineering	3	1		20	80	100
2	MCA-402	.Net Framework and Programming in ASP.Net	3	1		20	80	100
3	MCA-403	Open source Operating System	3	1		20	80	100
4	MCA-404	Artificial Intelligence	3	1		20	80	100
5	MCA-___	Elective 1*	3	1		20	80	100
Practicals								
1	MCA-451	System Design Project			4	20	80	100
2	MCA-452	.Net Lab			4	20	80	100
3	MCA-453	Linux Lab			4	20	80	100
4	MCA-455	Colloquium (Group Discussion)			4	20	80	100
		Total				**180**	**720**	**900**
		***Elective 1**						
	MCA-405	E-Commerce						
	MCA-406	Compiler Design						
	MCA-407	Data Mining and Data Warehousing						

1	MCA-401	Software Engineering	3	1		20	80	100

Software Engineering Paradigms : Software Characteristics, Software myths, Software Applications, Software Engineering Definitions, Various Software Process Models, Process iteration, Process activities, The Rational Unified Process, Computer-aided software engineering

Project Management, Management activities, Project planning, Project scheduling, Risk management

Software Requirements, Functional and non-functional requirements, User requirements, System requirements, Interface specification, software requirement document

Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management

System Models, Critical Systems Specification, Risk-driven specification, Safety specification, Security specification, Software reliability specification

Software Metrics and Measures — Process Metrics, Project metrics, Software Project Planning, Empirical, Putnam, COCOMO. Risk Identification and Projection: RMMM, Project Scheduling and Tracking.

Application Architectures — Data processing systems, Transaction processing systems, Event processing systems, Language processing systems, User Interface Design — Design issues, The user interface design process, User analysis, User interface prototyping, Interface evaluation

Rapid Software Development — Agile methods, Extreme programming, Rapid application development, Software prototyping. Software Reuse — Design patterns, Generator-based reuse, Application frameworks, Application system reuse, Software Evolution

Verification and validation,— Planning verification and validation, Software inspections, Automated static analysis, Verification and formal methods.

Software Testing — System testing, Component testing, Test case design, Test automation.

Software Cost Estimation — Software productivity, Estimation techniques, Algorithmic cost modeling, Project duration and staffing.

Quality Management — Process and product quality, Quality assurance and standards, Quality planning, Quality control, Software measurement and metrics

Process Improvement — Process and product quality improvement, Process classification, Process measurement — Process analysis and modeling, Process change, The CMMI process improvement framework.

Text/References:

1. Software Engineering, Pressman, TMH
2. Software engineering, Ian Sommerville, 8th Ed., Addison Wesley Longman.
3. Software Engineering Fundamentals, Ali Behforooz, Hudson, Oxford

2	MCA-402	.Net Framework and Programming in ASP.Net	3	1		20	80	100

Introduction to .NET Framework : Genesis of .Net – Features of .Net - .Net binaries – Microsoft Intermediate Language – Meta Data - .Net types and .net name spaces – Common Language Runtime – Common Type System – Common Language Specification - .Net Applications using command line compiler and visual studio .net IDE.

Basics of ASP. NET : Introducing ASP .NET – Creating and deploying ASP .NET applications – Web forms – Web controls – working with events – Rich web controls – Custom web controls – Validation controls – Debugging ASP .NET pages.

Advanced ASP .NET : ASP .NET configuration – Business objects – HTTP Handlers – Caching in ASP .NET – ASP .NET security – Localizing ASP .NET applications – Deployment projects.

Building Web Services : Introduction to web services – Web services Infrastructure – SOAP – Building a web service – Deploying and publishing web services – Finding web services – Consuming web services.

ADO .NET: Basics of ADO .NET – Changes from ADO – Data Table – Data Views – Data Set – Data Relation Type – ADO .NET Managed Providers – OLEDB and SQL Managed Providers – OleDb Data Adapter Type.

Text/References:

1. Applied Microsoft.NET framework programming, Jeffrey Richter, MS Press.
2. NET framework essentials Thuan L. Thai, Hoang Q. Lam, O'Reilly.
3. Programming .NET components, By Juval Löwy, O'Reilly.

3	MCA-403	Open Source Operating System	3	1		20	80	100

Introduction to concept of Open source software, Linux , Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands, Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.

Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Metacharacters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Shell Procedures and Reporting, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging.

Linux System Administrations – File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (BootLoaders, LILO, GRUB, Bootstrapping, init Process, System services, Internet and Web service tools, E-mail, Remote Login and FTP, Networks and server setup, LAN, Connection with Internet, Setting up routers, Proxy Servers, Print Servers, File Server, Mail server, FTP server, Web server and News server, DHCP and NIS, Database server.

Text/References:

1. A practical Guide to Linux, Sobell, Pearson.
2. A Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson.
3. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, 5e, Pearson.

4	MCA-404	Artificial Intelligence	3	1		20	80	100

Concept of intelligence, Artificial intelligence, definition turning test, areas of application.

Search techniques, state space, Production rules, problem characteristics, production system characteristic, depth first, breadth first search methods and their analysis, Heuristic search method, generate and test, hill climbing, best first method, graph search, AND OR search methods, constraint satisfaction, backtracking.

Introduction to list and string processing and dynamic databases concept of knowledge, characteristics and representation schemes, Logic, prepositional and predicate calculus, resolution, semiatics nets, frames, conceptual dependency, scripts Monotonic reasoning, logical reasoning induction, natural deduction.

Nonmonotonic reasoning – default reasoning minimalist reasoning, statistical reasoning – Baye's theorem, certainty factors, dempster shafer theory, Fuzzy logic.

Concept of learning, inductive and deductive. Knowledge acquisition, rote learning, discovery analogy.

Concept of expert system, need for an expert system, Component and categories of an expert system, need for an expert system, Stages in the development of an expert system.

Text/References:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

5	MCA-405	E-Commerce						

Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, EDI Application in business.

Text/References:

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

6	MCA-406	Compiler Design

Introduction to translators, compilers, interpreters, compilation process. Programming language grammars, derivations, reductions, regular expression, context free language and grammar.

Lexical analyzer, input buffering, specification and recognition of tokens, introduction to finite automata, regular expressions to NFA, minimization of DFA, keywords and reserve word policies, LEX – the lexical analyzer generator.

Syntax analyzer, context free grammars, top down parsing, brute force parser, recursive descent parser, LL(1) parser, Bottom up parsing, operator precedence parsing, simple precedence parsing, LR parser, LALR parser, YACC – the parser generator.

Syntax directed translation schemes, implementation of syntax directed translators, synthesized attributes, inherited attributes, dependency graph, evaluation order, construction of syntax trees, directed acyclic graph of expression, bottom up evaluation of S- attributed definitions, L-attributed definitions, top down translation of L - attributed definitions.

Errors, lexical phase errors, syntactic phase errors.

Intermediate languages, postfix notation, syntax trees, parse trees, three address code, triples and indirect triples.

Translation of assignment statements, Boolean expressions, statements that alter flow of control array references, procedure calls, declarations, case statement, record structures.

Symbol tables, operation on symbol tables, symbol table organization for non-block structured languages, symbol table organization for block – structured languages.

Run time storage management, storage allocation and referencing data in block structured language, storage allocation.

Code optimization, sources of optimization, loop optimization, DAG and optimization of basic blocks. Code generation, a machine model, next use information register allocation and assignment, a simple code generator, code generation from DAG's, Peephole optimization.

Text/References:

1. Aho, Ullman and Sethi: Compilers, Addison Wesley.
2. Holub, Compiler Design in C, PHI.

7	MCA-407	Data Mining and Data Warehousing

Data Warehousing: Introduction, Definition, Multidimensional data transformation, OLAP operations, Ware house schema, Ware house Server, Other features. Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. Association Rules: A Prior Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.

Classification: Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error, Decision boundary, Discriminate functions, Non-parametric methods for classification.
Clustering: Hierarchical and non-hierarchical techniques, K-MEDOID Algorithm, Partitioning, Clara, Clarans. Advanced Hierarchical algorithms
Decision Trees: Decision tree induction, Tree pruning, Extracting classification rules from decision trees, Decision tree construction algorithms, Decision tree construction with presorting. Other Techniques for Data mining: Introduction, Learning, Neural Networks, Data mining using neural networks, Genetic algorithms. Web Mining: Web mining, Text mining, Content mining, Web structure mining. Searching Techniques: Optimal, non-optimal, Min-max, α –β pruning.

Text/References:

1. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Harcourt India Pvt.
2. Richard O. Duda, Peter E. Hart, Pattern Recognition and Scene Analysis, Tata McGraw Hill.
3. Ian H. Witten, Eibe Frank, Data Mining Practical Machine Learning Tools and Techniques With Java Implementations, Morgan Kaufmann Publishers.
4. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill.
5. D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press.
6. Michael J.A. Berry & Gordon Linoff , Mastering Data Mining The Art and Science of Customer Relationship Management, John Wiley & Sons Inc.
7. W. H. Innmon, Building the Data Warehouse, Wiley Computer Publishing.
8. Elaine Rich, Artificial Intelligence, Springer-Verlag.
9. Erik Thomsen, OLAP Solutions Building Multidimensional Information Systems, Wiley Dreamtech. India Pvt. Ltd.
10. Tom Soukup, Ian Davidson, Visual Data Mining, Wiley Dreamtech India Pvt. Ltd.

MCA Year 3 Semester V								
S.No.	COURSE CODE	SUBJECT	PERIODS			INTERNAL ASSESMENT	ESE	Subject TOTAL
			L	T	P			
1	MCA-501	Object Oriented Software Engineering	3	1		20	80	100
2	MCA-502	Analysis and Design of Algorithms	3	1		20	80	100
3	MCA-503	Wireless Technologies	3	1		20	80	100
4	MCA-___	Elective 2*	3	1		20	80	100
5	MCA-___	Elective 3**	3	1		20	80	100
Practicals								
1	MCA-551	Software Project			4	20	80	100
2	MCA-552	ADA Lab			4	20	80	100
3	MCA-553	Wireless Tech. Lab			4	20	80	100
4	MCA-554	Seminar			4	20	80	100
		Total				**180**	**720**	**900**
		***Elective 2**						
	MCA-504	Bio-Informatics						
	MCA-505	Geo-Informatics						
	MCA-506	Information Protection and Security						
		****Elective 3**						
	MCA-507	Embedded Systems						
	MCA-508	ERP Systems						
	MCA-509	Soft Computing						

1	MCA-501	Object Oriented Software Engineering	3	1		20	80	100

Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams

Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram. Basic idea of behavioral modeling.

Object- oriented concepts and principles. Identifying the elements of an object model. Object oriented projects metrics and estimation.

Design for object – oriented systems. The system design process.

Object – oriented testing – testing OOA and OOD models. The object – oriented testing strategies. Inter class testing.

Technical metrics for O-O systems. Class oriented metrics and metrics for O-O projects.

Advanced topics in software engineering. Component based software engineering and development. Classifying and retrieving components.

Text/References:

1. Designing Flexible Object Oriented Systems with UML. By Charls Richter Techmedia.
2. UML users guide by Booch. Rumbaugh, Jacobson –Addison Wesley
3. Object Oriented Modeling and Design by Rumbaugh.
4. Object Oriented Analysis & Design – Practical Applications By Booch – Addison Wesley.

2	MCA-502	Analysis and Design of Algorithms	3	1		20	80	100

Introduction:- algorithm definition and specification – Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences, Performance analysis – Elementary Data structures:- stacks and queues – trees – dictionaries – priority queues –sets and disjoint set union – graphs – basic traversal and search techniques.

Divide – and – conquer:- General method – binary search – merge sort – Quick sort – The Greedy method:-General method – knapsack problem – minimum cost spanning tree – single source shortest path.

Dynamic Programming – general method – multistage graphs – all pair shortest path – optimal binary search trees – 0/1 Knapsack – traveling salesman problem – flow shop scheduling.

Backtracking:- general method – 8-Queens problem – sum of subsets – graph coloring – Hamiltonian cycles – knapsack problem – Branch and bound:- The Method – 0/1 Knapsack problem – traveling salesperson.

Parallel models:-Basic concepts, performance Measures, Parallel Algorithms: Parallel complexity, Analysis of Parallel Addition, Parallel Multiplication and division, parallel Evaluation of General Arithmetic Expressions, First-Order Linear recurrence.

Text/References:

1. .Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India.
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

3	MCA-503	Wireless Technoolgies	3	1		20	80	100

Introduction, wireless transmission - frequencies for radio transmission - signals - antennas - signal propagation - multiplexing - modulation - spread spectrum - cellular systems - medium access control - specialized MAC - SDMA - FDMA - TDMA - aloha - CSMA - collision avoidance - polling - CDMA - comparison of S/T/F/CDMA

Telecommunication systems - mobile services - system architecture - radio interface - protocols - localization and calling - handover - security - new data services - satellite systems- broadcast systems - digital audio broadcasting - digital video broadcasting, WDM Optical networks.

Wireless LAN - infrared Vs radio transmissions - infrastructure and adhoc networks - IEEE 802.11 b/a/g - bluetooth - IEEE 802.16, Mobile network layer - mobile IP - packet delivery - registration - tunneling and encapsulation - optimizations - reverse tunneling - dynamic host configuration protocol

Adhoc networks - routing - algorithms - metrics - mobile transport layer - TCP - indirect TCP - snooping TCP - mobile TCP - retransmission - recovery - transaction oriented TACP - support for mobility - file systems - WWW - WAP - architecture - datagram protocol - transport security - transaction protocol - session protocol - application - environment - WML - WML script - wireless telephony application.

Text/References:

1. Shambhu Upadhyaya, Abhijeet Chaudhary, Kevin Kwiat, Mark Weises, "Mobile Computing", Kluwer Academic Publishers
2. UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, "Principles of Mobile Computing", Springer International Edition
3. Stallings, W; Wireless Communications and Networks
4. Umar, A., Mobile Computing and Wireless Networks – Technology Briefing

5. Blake Roy, Wireless Communication Technology, Thompson
6. Schiller J., Mobile Communications, Pearson Education.
7. C. Siva Ram Murthy, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson Education.
8. C. Siva Ram Murthy, WDM Optical Networks: Concepts, Design, and Algorithms, Pearson Education.
9. Singhal et.al S., The Wireless Application Protocol, Addison Wesley

4	MCA-504	Bio-Informatics

Introduction – Importance of Bioinformatics – Biological Sequence Structure – Deficit – Genome Projects – Status – Sequence analysis – Homology and analogy.
EMBNET – NCBI – virtual Tourism.
Primary Sequence Databases Biological data base – Primary Sequence Database – Composite Protein Sequence Database – Secondary Database - Composite Protein – Pattern database structure and classification of database.
Genome Information Resources - DNA Sequence data base – Specialised genomic Resources.
DNA Sequence analysis : Why analyse DNA? – Gene structure – Features of DNA sequence analysis – Issues in the interpretation and EST search – Approach of Gene hunting – Cell CDNA libraries and ESTs – Approaches to EST analysis – Effect of EST data on DNA data base examples of EST analysis.
Data Base Searchers and Pair Wise Alignment Data base searching – Alphabets and Complexity – Comparing Two Sequences – Sub-Sequence – Identity and Similarity – Dot plots – Simple alignment – Gaps – Scoring Matrices – Dynamic programming – BLAST and its relative – FSTA and related algorithms – Alignment scores and statistical significance of data base sequences.
Global and local Alignments : Algorithms – Similarities – Semi global alignment
Multiple Sequence Alignment : Goal – Definition – Consensus – Complex – methods – Database of multiple Alignment – searching database with multiple alignment.
Methods of Photo Genetics.: Distance Based Methods – Based Methods – Comparison.
RNA Structure: Amino Acids – Polypeptide Composition Algorithm – Modeling protein folding prediction – RNA Sequence Structure.
Proteomics: Classification – Techniques – Inheritors – Drying Design – Structures – X-Ray Crystal – NMR – Empirical methods and prediction techniques.

Text/References:

1. T.K.Attwood, D.J. Parry-Smith, Introduction to Bioinformatics, Pearson Education Asia
2. Dan E. Krane, Michale L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education Asia.

5	MCA-505	Geo-Informatics

Basic concepts about Spatial information, Definition, Historical evolution and need for spatially based resource information system, objectives of GIS - Manual v/s automated GIS.

Data structure types of data structure, Raster and Vector formats, advantages and disadvantages of various data structures and data formats.
Data input: data pre-processing, methods of data capture, digitization and scanning methods, commonly used map projections and ellipsoids.
The format of GIS - Handling digital Geographical Information Data - Analysis of single data planes in Raster format - Analysis of Multiple data planes in Raster format - Uses of topographic data in Raster format - Data structures for thematic maps.
Digital Elevation Model (DEM): need, methods, data sources and products of DEM - Digital Terrain Modeling (DTM) - Input verification, storage and methods of data analysis for Spatial modeling - Methods of GIS and Spatial interpolation

Text/References:

1. Geographical Information System for Geoscientists by Bonham-Carter G.F., Pergamon Press, Tarrytown, New York, 1994.
2. Principles of Geographical Information System for Land Resources Assessment by Burrough, PA., Clarendon, Press, Oxford, 1986.
3. Geographical Information System by Fraser Taylor, D.R., The Microcomputer and Modem Cartography, Pergamon Press, 1991.
4. Mathematical Geography by Jameson, A.H. and Mormsby, M.t. Mormsby., Vol I and II, Sir Issac Pitman and Sons Ltd. London.
5. Cartographical design and production by Keates, J.S., London, Longman group, 1973.
6. Topographic Surveying by Wilson, H.M., John Wiley and sons, New York.
7. Geographic Information System by Les Worall, (Ed), Development and Applications, Beihaven Press, 1990
8. Remote Sensing and Image Interpretations by Thomas M. Lillesand and Ralph W. Kiefer., John Wiley and Sons, New York, 1994.
9. Mapping from Aerial Photographs by Burnside, CD., Collins Publishers. 1985.
10. Maps and Map making - Royal Geographical Society by Reeves, E.A., London.
11. Coordinate Systems and Map Projections by Mailing, D.H., George Philip and Sons Ltd.

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.
Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.

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

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

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

Text/References:

1. Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall.
2. Stallings, W.,. Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.
3. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
4. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.
5. Johannes A. Buchmann, "Introduction to cryptography", Springer- Verlag.

7	MCA-507	Embedded Systems							

An Overview of Embedded system, Requirements, Challenges issues, and trends in software development.

Application market segments, control system and industrial automation, Data communication, Networked Information Appliances, Telecommunications.

Hardware Architecture: Processor, Memory, Latches and buffers, ADC & DAC, Application specific control, Display units, keypads, DSP.

Microcontrollers and their applications, Communication interfaces: Serial interface, IEEE 1394, USB, Infra red, Ethernet and PCI bus.

Embedded system development process : requirement , system architecture, operating system and processes. Development platform and tools, HLL support Cross compilers, Linux and Windows CE based development Tools. Mobile/ handheld systems.

Basic idea of embedded system application like mobile networks, GPS, Real time system, Database applications, Networked and JAVA-enabled information appliances, Mobile JAVA applications.

Text/References:

1. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid / Tony Givargis, 2006 reprint, John Wiley Student Edition.
2. An Embedded Software Primer, David .E. Simon, Fourth Impression 2007, Pearson Education.
3. Embedded Microcomputer Systems, Valvano, Thomson.

4. Performance Issues of an Embedded System http://embedded.com.
5. Computers As Components: Principles of Embedded Computing System Design, 2nd Edition. Morgan Kauffman.

8	MCA-508	ERP Systems

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules.

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

Concept of E – Governance: Concept, E – Governance frame work, area of application like public sector, service industry.

Text/References:

1. A. Lexis Leon, Enterprise Resource Planning, TMH
2. Brady, Manu, Wegner, Enterprise Resource Planning, TMH

9	MCA-509	Soft Computing

Overview of Crisp sets and fuzzy sets : Basic concepts of crisp sets and fuzzy sets, Basic types of fuzzy sets, Fuzzy sets verses crisp sets, Representation and extension principle for fuzzy sets, Operations on Fuzzy sets

Fuzzy Relations and Fuzzy Logic: Crisp versus Fuzzy relations, Binary relations on fuzzy sets, Equivalence, compatibility and ordering relations, Morphisms and compositions of relations, Fuzzy relations equations, Fuzzy measures and possibility theory, Classical logic and multivalued logics, Fuzzy propositions and approximate reasoning

Fuzzy systems and neuro fuzzy systems : Relevance of integration between fuzzy sets and neural networks – pros and cons, Fuzzy neurons, Fuzzy neural networks, Neuro fuzzy systems, Fuzzy associative memories

Introduction to Genetic Algorithms : What are genetic algorithms?, Robustness of traditional optimisation and search methods, The Goals of optimisation, How are genetic algorithms different from traditional methods?, A simple genetic algorithm, Genetic algorithms at work – a Simulation by hand, Grist for the Search Mill – Important Similarities, Similarity Templates (Schemata), Learning the Lingo.

Genetic Algorithms Revisited : Mathematical Foundations, Who shall live and who shall die? The fundamental Theorem, Schema processing at work: An example by hand revisited. The two-armed and k-armed bandit problem, How many schemata are processed usefully?, The building block hypothesis, Another perspective: The minimal deceptive problem, Schemata revisited: similarity templates as hyper planes.

Computer Implementation of A Genetic Algorithm : Data Structures, Reproduction, Crossover, and mutation, A Time to reproduce, a time to cross, Get with the main program, How well does it work?, Mapping objective functions to fitness form, Fitness scaling, Codings, A multiparameter, Mapped, Fixed-Point coding, Discretization, Constraints

Introduction To Genetic-Based Machine Learning : Genetics-Based machine learning: whence it came, What is a classifier system?, Rule and message system, Apportionment of credit: The bucket brigade, Genetic algorithm, A simple classifier system in Pascal, Results using the simple classifier system

Text/References:

1. G. Klir and B. Yuan "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall of India, 1997.
2. B. Kosko "Neural Networks and Fuzzy Systems" A Dynamical Systems Approach to Machine Intelligence", Prentice Hall of India, 1997.
3. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning, Addison-Wesley an imprint of Pearson Education Asia.

MCA Year 3 Semester VI								
S.No.	COURSE CODE	SUBJECT	PERIODS			INTERNAL ASSESMENT	ESE	Subject TOTAL
			L	T	P			
1	MCA-601	Industrial Project***				50	150	200
		Total				**50**	**150**	**200**
		Grand Total						**4700**

Guidelines:

1. Paper MCA – 104, Excercises must be carried out in Linux environments.
2. Paper MCA – 457, At least one case study of an industry standard software must be carried out with one system design project. This will be a group activity having maximum of 3 students.
3. Paper MCA – 551 will be a group activity having maximum of 3 students.
4. Paper MCA – 554 will be individual activity in which student has to prepare and present a seminar along with report on some latest topic related with information technology.