BANGALORE UNIVERSITY

REGULATIONS, SCHEME AND SYLLABUS

For the course

MASTER OF COMPUTER APPLICATIONS (MCA)

I to VI Semesters

(Choice Based Credit System –Y2K14 Scheme)

Revised w.e.f.

Academic Year 2014-15 and onwards

MCA PROGRAMME
JNANABHARATHI CAMPUS
BANGALORE UNIVESITY, BANGALORE

BANGALORE UNIVERSITY

Regulations of Master of Computer applications (MCA) Course

1 **TITLE OF THE COURSE:** The course shall be called MCA – Master of Computer Applications.

2 **DURATION OF THE COURSE**: The course of study shall be three years.

3 **ELIGIBILITY FOR ADMISSION**: A candidate with any degree of a minimum of 3 years duration (10+2+3) of Bangalore university or of any other University equivalent there in to with a minimum of 50% of marks in the aggregate of all subjects including languages, if any, provided further, that the candidate has studied mathematics / Computer science /Business Mathematics / Statistics / Computer Applications / Electronics as a subject at PUC level or equivalent HSC (XII Standard) or at Degree level is eligible for admission to MCA Course. Relaxation to SC/ST, Group I be extended as per University norms.

4 **ATTENDANCE**: In each Semester a candidate should be considered to have successfully undergone the prescribed Course of study if the candidate has attended at least 75% of the classes in each subject (Theory , Lab & Practical).

5 **SCHEME OF EXAMINATION**:

A The Internal Assessment marks should be decided for each of the theory subjects by conducting 2 tests , each of 60 minutes duration, spread over the span of a Semester. A seminar should also be given by the student in the third year and the same to be assessed and evaluated for internal assessment along with the two tests.

B The Internal Assessment marks in Practical course is based on the performance in the Laboratory. The Internal Assessment marks for Project work of a candidate is based on the dissertation Seminar.

6 **ELIGIBILITY TO GO TO THE HIGHER SEMESTER**:

A A Candidate is allowed to carry over all the previous uncleared (failed) theory papers and Practicals to subsequent semesters from the first to sixth semester.

B The maximum period for completion of the course shall be six years from the date of admission.

7 **MINIMUM FOR PASS AND DECLARATION OF RESULTS**

A For a pass in a semester, a candidate shall secure a minimum of 40% of the marks prescribed for a subject in the University Examination (Theory, Practical, Project work) and 50% of the marks in the aggregate inclusive of the Internal Assessment marks obtained in all subjects put together.

B The candidates who do not satisfy 7(a) shall be deemed to have failed and have to take exams in the subjects in which he has secured less than 40% at the University examination.

C Provision is made for rejection of results of all the subjects of a Semester only once, if the candidate decides to reappear for all the subjects of that semester. Such rejection should be made within 30 days of announcement of result, by making a written application, through the Head of the Institution. If such rejection is in respect of the results of all the subjects of one semester and earn fresh Internal marks as well.

D The results of any semester will be declared as pass or fail as the case may be in accordance with regulation 7(a).

E To be eligible for the award of the MCA degree, a candidate shall have completed the scheme of training and passed in all subjects prescribed for the Course

F Further to regulation 7(a), the classification followed by the University for all PG courses shall be made applicable for the declaration of results of each Semester.

8 **CLASSIFICATION OF RESULT FOR THE MCA COURSE AND DECLARATION OF RANKS**:

Further to regulations 7(a) and 7(f), the names of all successful candidates securing First Class with Distinction and First Class in the First attempt shall be arranged in the order of Merit and only first FIVE Ranks shall be declared.

9 A candidate shall complete examinations of all Semesters of MCA Course within - **SIX** years from the date of admission

SCHEME OF STUDY AND EXAMINATION FOR MASTER OF COMPUTER APPLICATIONS (MCA)

Sem	Paper Code	Title of the paper	Hours / Week	Marks			Credits	
				IA	Exam	Total	Subject	Sem
I	MCA101T	Problem Solving Techniques using C	4	30	70	100	4	24
	MCA102T	Accounting and Financial Management	4	30	70	100	4	
	MCA103T	Digital Electronics and Microprocessor	4	30	70	100	4	
	MCA104T	Discrete Mathematics	4	30	70	100	4	
	MCA105P	C Programming Lab	8	30	70	100	4	
	MCA106P	Accounting Lab	8	30	70	100	4	
II	MCA201T	Data Structures	4	30	70	100	4	24
	MCA202T	Database Management System	4	30	70	100	4	
	MCA203T	Computer Networks	4	30	70	100	4	
	MCA204T	Operating System	4	30	70	100	4	
	MCA205P	Data Structures Lab	8	30	70	100	4	
	MCA206P	DBMS Lab	8	30	70	100	4	
III	MCA301T	File Structures	4	30	70	100	4	26
	MCA302T	Object Oriented Analysis and Design using UML	4	30	70	100	4	
	MCA303T	Theory of Computation	4	30	70	100	4	
	MCA304T	Statistical Analysis	4	30	70	100	4	
	MCA305P	File Structures Lab	8	30	70	100	4	
	MCA306P	Object Oriented Analysis and Design using UML Lab	8	30	70	100	4	
	MCA307T	Soft Core – Quantitative, Teaching and Research Aptitude	3	30	70	100	2	
IV	MCA401T	Advanced Java Programming	4	30	70	100	4	26
	MCA402T	Advanced Algorithms	4	30	70	100	4	
	MCA403T	Advanced Software Engineering	4	30	70	100	4	
	MCA404T	Quantitative Techniques	4	30	70	100	4	

	MCA405P	Advanced Java Programming Lab	8	30	70	100	4	
	MCA406P	Advanced Algorithms Lab	8	30	70	100	4	
	MCA407T	Soft Core – Soft Skills and Personality Development	3	30	70	100	2	
V	MCA501T	Advanced Web Programming	4	30	70	100	4	24
	MCA502T	Advanced Database Management Systems	4	30	70	100	4	
	MCA503T	Artificial Intelligence	4	30	70	100	4	
	MCA504T	Open Elective	4	30	70	100	4	
	MCA505P	Advanced Web Programming Lab	8	30	70	100	4	
	MCA506P	Mini Project	8	30	70	100	4	
VI	MCA601T	Elective – I	4	30	70	100	4	16
	MCA602T	Elective – II	4	30	70	100	4	
	MCA603P	Main Project	16	150	250	400	8	

List of Electives

1. Distributed Operating Systems
2. Software Testing
3. Parallel Algorithms
4. Compiler Design
5. Multimedia Communication
6. e-Governance
7. Image processing
8. Mobile Computing
9. TCP / IP
10. Cloud Computing
11. Storage Area Network
12. Data Mining
13. Big Data Analytics

FIRST SEMESTER MCA

MCA101T: PROBLEM SOLVING TECHNIQUES USING C

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Introduction to Programming Concepts: Software, Classification of Software, Modular Programming, Structured Programming, Algorithms and Flowcharts, Writing algorithms and drawing flowcharts for simple exercises. Overview of C Language: History of C, Character set, C tokens, Identifiers, Keywords, structure of C program, executing a C program. Constants, variables, data types, declaration of variables, declaration of storage classes, assigning values to variables defining symbolic constants, declaring a variable as constant, declaring a variable as volatile, overflow and underflow of data, Operators in C, Hierarchy of Operators, Expressions, Type Conversions and Library Functions.

UNIT – II [10 Hours]

Managing Input and Output Operations: The scanf() & printf() functions for input and output operations, reading a character, writing a character, (the getchar() & putchar() functions) , the address operator(&), formatted input and output using format specifiers, Writing simple complete C programs. Control Statements: Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples. Loop Control Structures: The while statement, the do..while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples.

UNIT – III [10 Hours]

Functions: Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions. Arrays: Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi Dimensional Arrays - Passing arrays to functions. Strings: Declaring and Initializing strings, Operations on strings, Arrays of strings, passing strings to functions. Storage Classes - Automatic, External, Static and
Register Variables.

UNIT – IV [10 Hours]

Structures and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures, bit fields, programming examples. Pointers: Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, chain of pointers, pointer expressions, pointers and arrays, pointer and character strings, array of pointers, pointer as function arguments, functions returning pointers, pointers to functions, pointers and structures, programming examples

UNIT – V [10 Hours]

File Management in C: Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, programming examples. Dynamic Memory Allocation: Dynamic memory

allocation, allocating a block of memory: malloc, allocating multiple blocks of memory: calloc, releasing the used space: Free, altering the size of a block: realloc, programming examples. The Preprocessor: Introduction, macro substitution, files inclusion, compiler control directives, ANSI additions, programming exercises.

Reference

1. *E. Balaguruswamy, "Programming in ANSI C", 4th Edition, TMH Publications, 2007.*
2. *Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education, 2006.*
3. *Mahapatra, " Thinking In C ", PHI Publications, 1998.*
4. *Yashwant Kanetkar, "Let Us C", 13th Edition, PHP, 2013.*

MCA102T: ACCOUNTING AND FINANCIAL MANGEMENT

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Accounting: Principles, concepts and conventions, double entry system of accounting, Introduction to basic books of accounts of sole proprietary concern, closing of books of accounts and preparation of trial balance. Final Accounts: Trading, Profit and Loss accounts and Balance Sheet of sole proprietary concern (Without adjustments).

UNIT - II [10 Hours]

Company accounts: features of company, types of companies advantages of companies, types of shares and debentures. Preparation of Final accounts of companies. (simple problems only).

UNIT - III [10 Hours]

Financial Management: Meaning, scope and role, A brief study of functional areas of financial management. Introduction to Various FM Tools: Financial statement analysis. Common size and comparative statement analysis of income and balance sheets

UNIT - IV [10 Hours]

Ratio Analysis, Fund flow statement & Cash flow statement.

UNIT - V [10 Hours]

Introduction to Cost Accounting: Nature, Importance & Basic Principles. Brief Introduction to methods of Costing & Elements of Cost, Unit Costing.

Reference

1. *Ramachandran, "Financial Accounting for Managers", Tata McGraw Hill – 2005*
2. *I.M. Pandey, "Financial Management", Vikas Publications, 2003*
3. *Neeraj Sharma "Computerized Accounting & Business Systems", Kalyani Publishers, 2004*

MCA103T: DIGITAL ELECTRONICS AND MICROPROCESSOR

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction to Number Systems: Positional and non-positional, Base/ Radix. Decimal number system, Binary number system, Octal Number System and Hexadecimal Number System, Conversion from one System to another System. Binary addition, subtraction, multiplication and division. 1's and 2's complement – 2's complement subtraction. Binary codes: BCD numbers, 8421 code, 2421 code- examples and applications. Gray code- Conversions- Gray to binary and Binary to Gray, application of gray code. Excess – 3 code - Self complementing property and applications. Boolean algebra: - Laws and Theorems. AND, OR, NOT Laws, Commutative law, Associative law, Distributive law, Duality theorem. Demorgan's theorems – Statements, proof using truth tables; Simplification of Boolean expressions using Boolean laws. Definition of product term, sum term, min term ,max term, SOP, standard SOP, POS and Standard POS. Conversion of Boolean expression to Standard SOP and Standard POS forms.

UNIT – II [10 Hours]

Karnaugh maps- Definition of Karnaugh map, K- map for 2, 3 and 4 variables. Conversion of truth tables into k-map, grouping of cells, redundant groups and don't care conditions. Karnaugh map technique to solve 3 variable and 4 variable expressions. Simplification of 3 and 4 variable Boolean expression using K-maps. AND Gate, OR Gate, NOT Gate, NAND Gate and NOR Gate - Definition, Symbol, Expression, Truth Table. Combinational logic circuits: Definition, applications. Half Adder: Symbol, Logic circuits using XOR and basic gates, Truth table. Full Adder: Symbol, Logic circuits using XOR and basic gates, Truth table.

UNIT – III [10 Hours]

Sequential circuit design: Latches, SR Flip Flops, concept of edge triggering, D- flip flop, JK- flip flop, Master slave flip flop, T- flipflop, Registers, shift Registers, asynchronous and synchronous counters, Mod 10 – counter. Introduction to Microprocessor: Introduction, Applications, Basic block diagram, speed, word size, memory capacity, classification of Microprocessors (mention of different microprocessors). 8086Architecture and programming: 8086 Architecture and programming model, registers, flags, memory segmentation, pin description, odd & even bank of memory, Bus buffering, latching, timing diagrams, wait state, MIN/MAX modes of operation.

UNIT – IV [10 Hours]

Addressing modes: Immediate addressing, register addressing, memory addressing, indexed addressing with displacement, I/O port addressing. 8086 Instructions: Instruction template for 8086 instructions, code generation using template. Data Transfer Instruction: Move date to register/memory from register/memory/immediate data, data transfer between a segment register and register/memory, PUSH and POP, exchange, data transfer with I/O ports.

UNIT – V [10 Hours]

Data Conversion instructions: XLAT, LEA, LDS, LES, LAHF and SAHF instructions. Arithmetic Instructions: Add, subtract, negate, compare, CBW, CWD, multiply and divide instructions. Logical Instructions: AND, OR, EX-OR, Test, NOT, ROTATE and shift instructions. Process Control Instructions: Instructions to set/reset flags, halt, wait, lock, prefix and escape to co-processor instructions. String Instructions: CMPS, MOVS, LODS, STOS, and SCAS instructions. Branch Instructions: JMP, conditional jump, LOOP, LOOPE, LOOPNE, JCXZ, CALL, RET. Assembly language programming: Assembly language programming examples, subroutines and macros, examples. Interrupts of 8086: Hardware interrupt, software interrupt and exception, priority of interrupts

Reference

1. *Thomas L Floyd, "Digital Fundamentals", Pearson Prentice Hall, 9th Edition, 2006.*
2. *M Morris Mano, "Digital Logic and Computer Design, Pearson, 10th Edition, 2008.*
3. *Tokheim, "Digital Electronics Principles and Applications, McGraw Hill, 6th Edition, 2004.*
4. *Barry B. Brey, "The Intel Microprocessors", Pearson Prentice Hall, 8th Edition, 2009.*
5. *Ramesh S. Gaonkar, "Microprocessor Architecture, programming and Applications", New Age International Pvt Ltd Publishers, 2nd Edition, 1995.*

MCA104T: DISCRETE MATHEMATICS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Set Theory: Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Cartesian Products and Relations, Functions–One-to-One, Onto Functions, Function Composition and Inverse Functions; Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.

UNIT – II [10 Hours]

Fundamentals of Logic: Proposition, Logical Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference; The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

UNIT – III [10 Hours]

Mathematical Induction and Recursion: Sequences and summations, Mathematical Induction, The Well Ordering Principle, Recursive Definitions, Structural Induction, Recursive algorithms. Counting: Basics of counting, Pigeonhole Principle, Permutation and Combinations, Binomial coefficients.

UNIT – IV [10 Hours]

Discrete Probability: Introduction, Probability Theory, Expected value and Variance.
Advanced Counting Techniques: Recurrence relations and its solutions, Generating functions, Inclusion – Exclusion and its applications Relations: Introduction, n-ary relations and applications, Representing relations, Closures of Relations, Equivalence Relations, Partial Orderings

UNIT – V [10 Hours]

Graphs: Introduction, Representing Graphs & Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest path problems, Planar Graphs, Graph colouring. Trees: Introduction, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Reference

1. *Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004.*
2. *Kenneth H. Rosen, "Discrete Mathematics and its Applications", 6th Edition, McGraw Hill, 2007.*
3. *Jayant Ganguly, "A Treatise on Discrete Mathematical Structures", SanguinePearson, 2010.*
4. *D.S. Malik and M.K. Sen, "Discrete Mathematical Structures: Theory and Applications", Thomson, 2004.*
5. *Thomas Koshy, "Discrete Mathematics with Applications", Elsevier, 2005, Reprint 2008.*

MCA105P: PROBLEM SOLVING TECHNIQUES USING C LAB

1. Write a C Program to demonstrate all the operators.
2. Write a C Program for electricity bill tacking different Categories of users, different slabs in each category.
3. Write a C Program to find check whether the given number is Prime or not.
4. Write a menu driven C Program to find the factorial of number (a) Without function (b) Using non-recursive function (c) Using Recursive Function.
5. Write a C Program to check the correctness of the date and compare two dates.
6. Write a C Program to find the sum of its individual digits repeatedly till the result is a single digit.
7. Write a program to enter integer number and find the largest and smallest digit of the number.
8. Write a program to read three digits +ve integer number 'n' and generate possible permutations of number using their digits.
9. Write a C Program to accept a text upto 50 words and perform following actions
    a) Count total vowels, constants, spaces, sentences and words with spaces.
    b) Program should erase more than one space between two successive words.
10. Write a C program to enter names of cities and display all the entered names alphabetically.
11. Write menu Driven C Program to calculate to calculate sin, cos and exponential series without using standard library function.
12. Write a C Program to accept array of elements in unsorted order, sort the array and search an element using binary search.
13. Write a C Program to add and multiply two matrices.
14. Write a C Program to display list of C program files and directories.
15. Write a program to use macros as an array and pointer.
16. Write a program to display the attributes of a file using dos interrupt.
17. Write a program to delete a file using dos interrupt.
18. Create user defined data type equivalent to int. Declare three variables of its type. Perform arithmetic operations using these variables.
19. Write a program to read a C program file and count the following in the complete program. a) Total number of statements b) Total number of included files c) Total number of brackets.
20. Write a program to display C Program files in current directory. The user should select one of the files. Convert the file contents in Capital and Display the same on the screen.
21. Write a program to interchange the contents of two files.
22. Write a program to change mouse cursor.

MCA106P: ACCOUNTING AND FINANCIAL MANAGEMENT LAB

1. Accounting software, introduction and installation.
2. Creation of accounts in the name of the trading and non-trading organisations, including alteration and deletion.
3. Creation of accounting groups and ledgers, using single and multiple options.
4. Creation of inventory groups and ledgers.
5. Vouchers, types and vouchers entry.
6. Creation of various accounting Ledgers.
7. Recording of various accounting transactions.
8. Inventory: classification and grouping using single and Multiple options.
9. Recording of inventory information.
10. Purchase order and sales order processing.
11. Correction of ledgers and vouchers using alter option.
12. Generating trial balance, income statement and balance sheet.
13. Displaying Income statement and balance sheet under different options and time periods.
14. Generation of accounting and inventory reports.
15. Printing of ledgers, invoice, cheques and statements.
16. Creation of pay roll records.
17. Recording of Pay roll information and salary statement.
18. Generating statutory reports.
19. Working with different accounting periods.
20. File import and export process.
21. Data protection and safeguard.
22. Practical training on preparation of computerised accounting for computer hardware stores.
23. Practical training on preparation of computerised accounting for a software development company.
24. Training on conversion of Manual accounting to computerised accounting.
25. Practical session on audit under computerised accounting environment.
26. Practical session on audit under computerised accounting environment.

SECOND SEMESTER MCA

MCA201T: DATA STRUCTURES

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction and Overview: Definition, Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithms complexity, time-space tradeoff. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. String Processing: Definition, Storing Stings, String as ADT, String operations, word/text processing, Pattern Matching algorithms.

UNIT – II [10 Hours]

Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Sorting: Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick Sort Searching: Linear Search, Binary search, Multidimensional arrays, Matrices and Sparse matrices.

UNIT - III [10 Hours]

Linked list: Definition, Representation of Singly linked list in memory, Traversing a Singly linked list, Searching a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly liked list; Doubly liked list, Header liked list, Circular linked list.

UNIT – IV [10 Hours]

Stacks: Definition, Array representation of stacks, Linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Conversion of infix expression to postfix expression, Evaluation of Postfix expression, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack. Queues: Definition, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues, Applications of queues.

UNIT - V [10 Hours]

Graphs: Graph theory terminology, Sequential representation of Graphs: Adjacency matrix, traversing a Graph. Tree – Definitions, Binary trees, Representing binary trees in memory, Traversing Binary Trees, Binary Search Trees, Searching, Inserting and Deleting in a Binary Search Tree, Heap, Heap Sort.

Reference

1. *Seymour Lipschutz, "Data Structures with C", Schaum's outLines, Tata McGrawHill, 2011.*
2. *Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.*
3. *Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design using C", Pearson Education, 2009.*
4. *Forouzan, "A Structured Programming Approach using C", 2nd Edition, Cengage Learning India, 2008.*

MCA202T: DATA BASE MANAGEMENT SYSTEMS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction: Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, When not to use a DBMS. Database System Concepts and architecture: Data Models, Schemas, and Instances. DBMS Architecture and Data Independence., Database languages and interfaces. The database system Environment, Classification of DBMS.

UNIT - II [10 Hours]

Data Modelling Using the Entity-Relationship Model: High level conceptual Data Models for Database Design with and example., Entity types, Entity sets, attributes, and Keys, ER Model Concepts, Notation for ER Diagrams, Proper naming of Schema Constructs, Relationship types of degree higher than two. Record Storage and Primary File Organization: Secondary Storage Devices. Buffering of Blocks. Placing file Records on Disk. Operations on Files, File of unordered Records (Heap files), Files of Ordered Records (Sorted files), Hashing Techniques, and Other Primary file Organization.

UNIT - III [10 Hours]

Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relational schemas, Functional Dependencies, Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Relational Data Model and Relational Algebra: Relational Model Concepts., relational Model Constraints and relational Database Schema, defining Relations, Update Operations on Relations., Basic Relational Algebra Operations, Additional Relational Operations., Examples of queries in the Relational Algebra., Relational Database design using ER-to-Relational Mapping.

UNIT – IV [10 Hours]

Relational Database Language: Data definition in SQL, Queries in SQL, Insert, Delete and Update Statements in SQL, Views in SQL, Specifying General Constraints as Assertions, specifying indexes, Embedded SQL. PL /SQL: Introduction.

UNIT - V [10 Hours]

Transaction Processing Concepts: Introduction, Transaction and System Concepts, Desirable properties of transaction, Schedules and Recoverability, Serializability of Schedules, Transaction Support in SQL, Locking Techniques for Concurrency Control, Concurrency Control based on time stamp ordering.

Reference

1. *Remez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.*
2. *Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, "Database System Concepts"*
3. *6th Edition, McGraw Hill, 2012.*
4. *C.J.Date, "Introduction to database systems", Eight Edition, Addison Wesley, 2003.*

MCA203T: COMPUTER NETWORKS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Introduction: Growth of computer networking, Complexity in network system, Motivation and Tools: Resource sharing, Growth of the internet, probing the internet, interpreting the ping response, tracing a route. Transmission Media: Copper wires, glass fibers, radio, satellite, Geosynchronous satellites, low earth orbit satellites, Low earth orbit satellite arrays, Microwave, Infrared, Light from a laser. Local Asynchronous Communications: Introduction, the need for asynchronous communications, using electric current to send bits, standards for communication, baud rate, Framing and errors, Half and Full duplex asynchronous communication, the effect of noise on communication. Long distance Communication: Sending signals across long distances, Modem hardware used for Modulations and Demodulation, Leased analog data circuits, optical, radio frequency and dialup Modems, carrier frequencies and Multiplexing, baseband and broadband technologies, wave length division multiplexing, spread spectrum, time division multiplexing

UNIT - II [10 Hours]

Packets, Frames and Error Detection: Concept of Packets, packets and Time-division Multiplexing, Packets and Hardware Frames, byte Stuffing, transmission errors, Parity bits and Parity checking, error detection, Detecting errors with checksums, detecting errors with CRC, Burst errors, frame formats and error detection mechanism. LAN Technologies and Network Topologies: Direct point-to-point communications, Shared Communications channels, LAN Topologies, Ethernet, Carries sense on CSMA, Collision Detection and Back off wih CSMA/CD, Ring Topology and Token Passing, Self-Healing Token Passing Networks, ATM. Hardware addressing and Frame Type Identification: specifying a recipient, How LAN hardware uses addresses to filer packets, format of a physical addresses, broadcasting, Multicast addressing, identifying packet contents, frame headers and frame format.

UNIT - III [10 Hours]

LAN Wiring, Physical Topology and Interface Hardware: speeds of LANs and computers, Network Interface Hardware, The connection between a NIC and a network, original thick Ethernet wiring, connection multiplexing, thin Ethernet wiring, twisted pair Ethernet, Network interface cards and wiring schemes, categories of wires. Extending LANs: Fiber Optic Extensions, Repeaters, bridges, frame filtering, switching, Long-distance and Local Loop Digital Technologies: Digital telephony, Synchronous communication, SONET, ISDN, Asymmetric Digital Subscriber Line Technology, other DSL technologies, cable modem technology, upstream communication, Broadcast Satellite systems.

UNIT - IV [10 Hours]

WAN technologies and Routing: Large Networks and Wide Areas, Packet switches, forming a WAN, store and forward, Physical addressing in a WAN, Next-Hop forwarding, Source independence, Routing Table Computation, Shortest path computation in a Graph, distance vector routing, like-state routing, Example of WAN technologies. Network Characteristics: Network ownership, Network performance characteristics, Jitter. Protocols and Layering: the need for protocols, the seven layers, Stacks: Layered Software.

UNIT - V [10 Hours]

Internetworking: internet architecture, A virtual Network, Layering and TCP/IP protocols. Internet Protocol Addresses, APR, IP Datagram's and Datagram Forwarding, IP Encapsulation, Fragmentation, and Reassembly, IPv6, ICMP, UDP, TCP, Internet routing, DNS, WWW, MAIL.

Reference

1. *Douglas E Comer and M.S.Narayana, "Computer Networks and Internets", 5th edition, Pearson Education, 2013.*
2. *Andrew S.Tanenbaum, "Computer Networks", Fifth Edition, Prentice Hall, 2012*
3. *Behrouz Ferouzan, "Introduction to Data Communications and Networking", TMH, 1999.*
4. *S. Keshav, "An Engineering Approach to Computer Networks", Pearson Education, 2nd Edition.*

MCA204T: OPERATING SYSTEMS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction: Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, System calls, System programs, Virtual machines. Process Management: Process Concept, Process Scheduling, Co – Operating process, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Real time Scheduling, Algorithm evolution.

UNIT – II [10 Hours]

Process Synchronization and deadlocks: The Critical Section Problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors, Dead locks – system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock, Combined approach to deadlock handling.

UNIT – III [10 Hours]

Memory Management: Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging in Mastics and Intel 386, Virtual memory-Demand paging and it's performance, Page replacement algorithms, Allocation of frames, thrashing, page size and other considerations. Demand Segmentation.

UNIT – IV [10 Hours]

File management (Systems, Secondary Storage Structure): File Concepts, Access methods, Directory Structure, Protection and consistency, File system structure, Allocation methods, Free space management, Directory Implementation, Efficiency and Performance, Recovery. Disk Management (Structure, Disk Scheduling Methods): Disk Structure & Scheduling methods, Disk management, Swap – Space management.

UNIT – V [10 Hours]

Protection and Security: Goals of protection, Domain Protection, Access matrix, Security Problem, Authentication, One time password, program threats, System threads.
Case Study of Windows and Linux Operating System

Reference

1. *Abraham Silberschatz and Peter Baer Galvin, "Operating System Concepts", 7th Edition, Pearson Education, 2002.*
2. *H.M.Deitel, "Operating Systems", Pearson Learning Solutions, 3rd Edition, 2003.*
3. *William Stallings, "Operating Systems", 6th Edition, Pearson Education, 2010.*
4. *Stuart, "Operating systems: Principles, Design and Implementation", 1st Edition 2008, Cengage Learning India.*

MCA205P: DATA STRUCTURES LAB

1. Write a menu driven program to implement linear and binary search also find the location of its first occurrence
2. Write a menu driven program to sort the array in ascending/descending order using a) Quick sort b) Merge sort
3. Write a menu driven program to create a linked list and to perform insert and delete operations
4. Write a program to add two polynomials using a linked list/
5. Write a menu driven program to perform insert and delete operations in a circular linked list.
6. Write a menu driven program to perform operations on a stack (linked list implementation)
7. Write a menu driven recursive program to a) find factorial of a given number b) generate first N terms of a fibonacci sequence c) GCD of three numbers.
8. Write a program to solve the problem of towers of hanoi with 3 pegs and N discs.
9. Write a menu driven program to perform operations on a circular queue (linked list implementation).
10. Write a menu driven program to a) find the length of a string b) concatenate two strings c) to extract a substring from a given string d) finding and replacing a string by another string in a text (Use pointers and user-defined functions)
11. Write a program to convert the given infix expression into its postfix form.
12. Write a program to evaluate the postfix expression with a set of values.
13. Write a menu driven program to create binary tree and to perform insert and delete operations.
14. Write a menu driven program to create a binary search tree and to perform inorder, preorder and postorder traversals
15. Write a program sort the array of N elements using Heap Sort.

MCA206P: DATA BASE MANAGEMENT SYSTEMS LAB

1. Database Customization
2. Creating Databases/Table spaces
3. Create Objects
4. Moving Data
5. Recovery
6. Locking
7. Preparing Applications for Execution using a front end tool
8. Application Performance Tool

The students are supposed to practice and develop a mini application for above mentioned lab. The students can do the activity in a group (team) consisting of not more than 2 students.

The entire application to be submitted by each team should be done with all the above activities. The examiner may ask to perform any of the above act

THIRD SEMESTER MCA

MCA301T: FILE STRUCTURES

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction: File Structures: The Heart of the file structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Buffer Management, Input /Output in UNIX. Fundamental File Structure Concepts, Managing Files of Records: Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.

UNIT – II [10 Hours]

Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Key sorting; Index: Introduction, A Simple Index for Entry- Sequenced File, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys. Consequential Processing and The Sorting of Large Files: A Model for Implementing Consequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Multi-way Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk.

UNIT – III [10 Hours]

Multilevel indexing and B-Trees: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging and Redistribution, Redistribution during insertion; B* Trees.

UNIT – IV [10 Hours]

Indexed Sequential File access and Prefix B+ Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.

UNIT – V [10 Hours]

HASHING: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, Collision resolution by progressive overflow, Buckets. How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.

Reference

1. *Michael J. Folk, Bill Zoellick, Greg Riccardi, "File Structures-An Object Oriented Approach with C++ -, 3rd edition, Addison-Wesley.*
2. *Raghu Ramakrishan and Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw Hill, 2003.*
3. *Robert L. Kruse, Bruce P. Leung, Clovis L.Tondo, "Data Structures and Program Design in C" (2nd Edition). Prenctice Hall I ndia, 2001.*
4. *Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures, 2007.*

MCA302T: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction: An overview - Object basics - Object state and properties, Behavior, Methods, Messages. Object Oriented system development life cycle, Benefits of OO Methodology. Overview of Prominent OO Methodologies: The Rumbaugh OMT, The Booch methodology, Jacobson's OOSE methodologies, Unified Process, Introduction to UML, Important views & diagram to be modelled for system by UML. Factional View (models): Use case diagram - Requirement Capture with Use case - Building blocks of Use Case diagram - actors, use case guidelines for use case models - Relationships between use cases - extend, include, generalize. Activity diagram - Elements of Activity Diagram - Action state, Activity state, Object, node, Control and Object flow, Transition (Fork, Merge, Join) - Guidelines for Creating Activity Diagrams - Activity Diagram - Action Decomposition (Rake) - Partition - Swim Lane.

UNIT – II [10 Hours]

Static structural view (Models): Classes, values and attributes, operations and methods, responsibilities for classes, abstract classes, access specification (visibility of attributes and operations). Relationships among classes: Associations, Dependencies. Inheritance - Generalizations, Aggregation. Adornments on Association: association names, association classes, qualified association, n-ary associations, ternary and reflexive association. Dependency relationships among classes, notations. Notes in class diagram, Extension mechanisms, Metadata, Refinements, Derived, data, constraint, stereotypes, Package & interface notation. Object diagram notations and modeling, relations among objects (links).

UNIT – III [10 Hours]

Class Modeling and Design Approaches: Three approaches for identifying classes - using Noun phrases, Abstraction, Use Case Diagram - Comparison of approaches - Using combination of approaches - Flexibility guidelines for class diagram: Cohesion, Coupling, Forms of coupling (identity, representational, subclass, inheritance), class Generalization, class specialization versus aggregation. Behavioral (Dynamic structural view): State diagram - State Diagram Notations, events (signal events, change events, Time events) - State Diagram states (composite states, parallel states, History states), transition and condition, state diagram behaviour (activity effect, do-activity, entry and exit activity), completion transition, sending signals.

UNIT – IV [10 Hours]

Interaction diagrams: Sequence diagram - Sequence diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in sequence diagram - Collaboration diagram - Collaboration diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in sequence diagram. Approaches for developing dynamic systems: Top - down approach for dynamic systems - Bottom - up approach for dynamic systems - Flexibility Guidelines for Behavioral Design - guidelines for allocating and designing behaviors that lead to more flexible design.

UNIT – V [10 Hours]

Architectural view: Logical architecture: dependency, class visibility, sub systems - Hardware architecture: deployment diagram notations, nodes, object migration between node - Process architecture: what are process and threads and their notations in UML, object synchronization, invocation schemes for threads (UML notations for different types of invocations). Implementation architecture: component diagram notations and examples. Reuse: Libraries, Frame works components and Patterns: Reuse of classes, Reuse of components, Reuse of frameworks, black box framework, white box frame, Reuse of patterns: Architectural pattern and Design pattern.

Reference

1. *Charles Richter, "Designing Flexible Object Oriented systems with UML" , Macmillan Technical, 1999*
2. *Jackson, Burd Thomson, "Object Oriented Analysis & Design", Thomson Course Technology, 2004*
3. *James Rumbaugh. Micheal Blaha, Object oriented Modeling and Design with UML. Pearson, second edition, 2005.*
4. *Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 1999.*
5. *James Rumbaugh, "Object Oriented Modeling and Design", Prentice Hall, 1991.*
6. *Joseph Schmuilers, "Teach Yourself UML in 24 Hours", Sams publication, 2004.*
7. *Mike O'Docherty, "Object-Oriented Analysis and Design: using UML", Wiley Publication, 2005.*

MCA303T: THEORY OF COMPUTATION

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Review of Mathematical Terms and Theory: Basic Mathematical Notations and Set Theory, Logic Functions and Relations, Language Definitions, Mathematical Inductions and Recursive Definitions. Finite Automata: Deterministic and Non Deterministic Finite Automata, U-Transitions, Conversion from NFA to DGA, Kleene's Theorem, Regular and Non Regular Languages.

UNIT – II [10 Hours]

Context Free Grammar: Introduction to CFG, CFG and Known Languages, Unions, Concatenations and *'s Notations and CFL, Derivatives of Trees and Ambiguity and Unambiguous CFG and Algebraic Expressions, Normal Forms and Simplified Forms.
Pushdown Automata, CFL and NFL: Introduction to PDA, Definition, DPDA, PDA Corresponding to CFG, CFG Corresponding to PDA, Introduction to CFL, Intersections and Complements of CFL, Decisions Problems and CFL.

UNIT – III [10 Hours]

Turing Machines, Recursive Language: Model of Computation and Church Turning Thesis, Definitions of Turing Machine, TM and Language Acceptors, Variations of TM, Non Deterministic TM, Universal TM, Enumerable and Language, Recursive and Non Recursive Enumerable.

UNIT – IV [10 Hours]

Computation Functions, Measuring, Classifications And Complexity: Primitive Recursive Functions, Halting Problem, Recursive Predicates and Some Bounded Operations, Unbounded Minimizations and μ-Recursive Functions, Godel Numbering, Computable Functions and μ-Recursive, Numerical Functions.

UNIT – V [10 Hours]

Tractable and Intractable Problems: Growth Rate and Functions, Time and Speed Complexity, Complexity Classes, Tractable and Possibly Intractable Problems, P and Np Completeness, Reduction of Time, Cook's Theorem, Np-Complete Problems.

Reference

1. *John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education, 2011.*
2. *John C Martin, "Introduction to Languages and Automata Theory", 3rd Edition, Tata McGraw-Hill, 2007.*
3. *Daniel I.A. Cohen, "Introduction to Computer Theory", 2nd Edition, John Wiley and Sons, 2009.*
4. *Thomas A. Sudkamp, "An Introduction to the Theory of Computer Science, Languages and Machines", 3rd Edition, Pearson Education, 2006.*

MCA304T: STATISTICAL ANALYSIS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Sample spaces - events - Axiomatic approach to probability - conditional probability - Independent events - Baye's formula - Random Variables - Continuous and Discrete random variables - distribution function of a random variables - Characteristic of distributions - Expectation, variance - coefficient of variation, moment generation function - Chebyshev's inequality

UNIT – II [10 Hours]

Bivariate distribution - conditional and marginal distributions - Discrete distributions - discrete uniform, Binomial poison and geometric Distributions - Continuous distributions - Uniform, Normal, Exponential and Gamma distributions.

UNIT – III [10 Hours]

Correlation coefficient - Rank correlation coefficient of determination - Linear Regression - Method of Least squares - Fitting of the curve of the form $ax + b$, $ax^2 + bx + c$, ab^x and ax^b - multiple and partial correlation (3 - variables only).

UNIT – IV [10 Hours]

Concept of sampling – Methods of sampling - simple random sampling - Systematic sampling and stratified random sampling (descriptions only) - concepts of sampling distributions and standard error - point estimation (concepts only) - Interval Estimation of mean and proportion. Tests of Hypotheses - Critical Region - two types of Errors - Level of significance - power of the test - Large sample tests for mean and proportion - Exact tests based on Normal, t, F and Chi-square distributions.

UNIT – V [10 Hours]

Basic principles of experimentation - Analysis of variance - one way and two way classifications - computing randomized design - Randomized Block design - Time series Analysis - Measurement of Trend and Seasonal variations.

Reference

1. *Mood, A.M., Graybill, F. and Boes, 1974, Introduction to Mathematical Statistics, McGraw-Hill.*
2. *Trivedi, K.S, 1994, Probability and Statistics with Reliability, Queuing and Computer Science Applications. Prentice Hall India, New Delhi.*
3. *Arnold O. Allen, 1978, Probability, Statistics and Queuing Theory with Computer Science Application.*
4. *Bajpai, A.C. Calus, I.M. Fairley, J.A., 1979, Statistical Methods for Engineers and Scientists. John Wiley & Sons.*
5. *Doughlas, C.,Montagomery, Lynwood,A. & Johnson, 1976, Forecasting and Time Series Analysis, Tata McGraw-Hill, New Delhi.*
6. *Baisnab, A.P. and Manoranjan Jas, 1993, Elements of Probability and Statistics, Tata McGraw-Hill, New Delhi.*
7. *Kossack, C.F. and Hensschkec, C.I., Introduction to Statistics and Computer Programming, Tata McGraw-Hill, New Delhi.*

MCA305P: ADVANCED DATA STRUCTURES LAB

1. Write a C++ Program to read series of names, one per line, from standard input and write these names spelled in reverse order to the standard output using I/O redirection and pipes. Repeat the exercise using an input file specified by the user instead of the standard input and using an output file specified by the user instead of the standard output.
2. Write a C++ program to read and write student object with fixed length records and the fields delimited by "|". Implement pack(), unpack(), modify(), and search() methods.
3. Write a C++ program to read and write student objects with Variable-Length records using any suitable record structure. Implement pack(), unpack(), modify(), and search() methods.
4. Write a C++ program to read and write student objects with Variable-Length records using any suitable record structure and to read from this file a student record using RRN.
5. Write a C++ program to implement simple index on primary key for a file of student objects. Implement add(), search(), delete() using the index.
6. Write a C++ program to implement index on secondary key, the name, for a file of student objects. Implement add(), search(), delete() using the secondary index.
7. Write a C++ program to read two lists of names and then match the names in the two lists using sequential Match based on a single loop. Output the names common to both the lists.
8. Write a C++ program to read k Lists of names and merge them using k-way merge algorithm with k = 8.
9. Write a C++ program to implement B-Tree for a given set of integers and its operations insert() and search(). Display the tree.
10. Write a C++ program to implement B+ Tree for a given set of integers and its operations insert() and search(). Display the tree.
11. Write a C++ program to store and retrieve student data from file using hashing. Use any collision resolution techniques.
12. Write a C++ program to reclaim the free space resulting from the deletion of records using liked list.

MCA306P: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML LAB

1. The student should take up the case study of Unified Library application which is mentioned in the theory, and Model it in different views i.e. Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.
2. Student has to take up another case study of his/her own interest and do the same whatever mentioned in first problem. Some of the ideas regarding case studies are given in reference books, which were mentioned in theory syllabus, can be referred for some idea.

MCA307T: QUANTITATIVE, TEACHING AND REASERCH APTITUDE

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT – I [8 Hours]

Numbers Property – Simplification – Divisibility – HCF and LCM – Decimal Fractions – Square roots and Cube Roots – Logarithms – Antilogarithms - Surds and indices - Permutation and Combination – Probability – Odd man out series - Number series - letter series – codes – Relationships – classification.

UNIT – II [10 Hours]

Time and work – Problems on Ages – Calendar – Clock – Pipes and Cistern – Time and Distance – Problems of Train – Boats and Streams. Area – Volume and surface Areas – Heights and Distances – Data Interpretation: Tabulation – Bar Graphs – Pie Charts – Line Graphs. Data Interpretation - Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data.

UNIT – III [10 Hours]

Simple Interest – Compound Interest – Stocks and Shares – True Discount – Banker's discount. Averages – Percentage – Profit and Loss - Ratio and Proposition – Partnership – Allegation and mixture – Chain rule. Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies: Word analogy Applied analogy; Verbal classification; Reasoning Logical Diagrams: Simple diagrammatic relationship, multidiagrammatic relationship; Venn diagram; Analytical Reasoning.

UNIT – IV [10 Hours]

Teaching: Nature, objectives, characteristics and basic requirements; Learner's characteristics; Factors affecting teaching; Methods of teaching; Teaching aids; Evaluation systems. Research Aptitude: Meaning, characteristics and types; Steps of research; Methods of research; Research Ethics; Paper, article, workshop, seminar, conference and symposium; Thesis writing: its characteristics and format. Reading Comprehension: A passage to be set with questions to be answered. Communication: Nature, characteristics, types, barriers and effective classroom communication.

UNIT – V [10 Hours]

Higher Education System: Governance, Polity and Administration; Structure of the institutions for higher learning and research in India; formal and distance education; professional/technical and general education; value education: governance, polity and administration; concept, institutions

Reference

1. *R.S. Aggarwal, Quantitative Aptitude, S. Chand & Company, New Delhi, 2012*
2. *Govind Prasad Singh and Rakesh Kumar, Text Book of Quickest Mathematics (for all Competitive Examinations), Kiran Prakashan, 2012.*
3. *R.S. Aggarwal, Objective Arithmetic, S. Chand & Company, New Delhi, 2005.*
4. *Dr. Lal, Jain, Dr. K. C. Vashistha, "U.G.C.- NET/JRF/SET Teaching & Research Aptitude", Upkar Prakashan, 2010.*
5. *"UGC NET/SLET: Teaching & Research Aptitude", Bright Publications.*

FOURTH SEMESTER

MCA401T: ADVANCED JAVA PROGRAMMING

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Introduction: Data Types, Operators, Classes, Inheritance, Packages and Interfaces. Exception Handling, Concurrency and Multithreaded programming, Enumerations, Autoboxing, Annotations, I/O, Generics, String handling

UNIT – II [10 Hours]

JVM: Java Class file, Class Loader, Linking model, Garbage collection, Type conversion, Floating Point Arithmetic, Method Invocation and Return, Thread synchronization. Java I/O: Closeable, Flushable Interfaces, The Stream classes, Bytes Streams, Character Streams, Console Class, Serialization. Java Networking - Networking
Classes and Interfaces, TCP/IP Sockets, Datagrams

UNIT – III [10 Hours]

Event Handling: Event Classes, Event Listener Interfaces, Adaptor Classes, Inner Classes. Comparable and Comparator. Java Sandbox security model, Applets. Server side programming - Java Servlets, JSP, Java XML library - JAXP, XML Parsing - DOM, SAX, Stax. Java Web Services – RESTful Web Services, SOAP Web Services

UNIT – IV [10 Hours]

Java Design patterns: Singleton, Observer, Adaptor, Proxy, Decorator, Factory, AbstractFactory, Fascade, Command, Template Method patterns, MVC.

UNIT – V [10 Hours]

Spring and Hibernate framework, Spring Flow, Hibernate Flow.

Reference

1. *Herbert Schildt, "Java The Complete Reference", 7th addition.*
2. *Ken Arnold, James Gosling, David Holmes, "The Java TM Programming Language", Addison-Wesley, 2006*
3. *Bill Venners, "Inside the Java 2 Virtual Machine", McGraw-Hill, 2nd edition, 2000.*
4. *Santhosh, "Spring and Hibernate", Tata McGraw-Hill.*

MCA402T: ADVANCED ALGORITHMS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

UNIT-II [10 Hours]

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.

UNIT-III [10 Hours]

Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT. Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

UNIT-IV [10 Hours]

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm Boyer – Moore algorithms. Approximation Algorithms: The vertex-cover problem; The traveling-sales-person problem; The set covering problem; The subset-sum problem.

UNIT-V [10 Hours]

Introduction Parallel Algorithms: Parallel Sorting Algorithms, Parallel Search Algorithms. Introduction to Amortization.

Reference

1. *T. H Cormen, C E Leiserson, R L Rivest and C Stein: "Introduction to Algorithms", 3rd Edition, Prentice-Hall of India, 2011.*
2. *Mark Allen Weiss, Data Structures and Algorithm analysis in C++, 3rd edition, PEA, 2011.*
3. *Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: "Fundamentals of Computer Algorithms",1st edition, University Press, 2012.*

MCA403T: ADVANCED SOFTWARE ENGINEERING

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Agile development: Agile, Agility and cost of change; Agile Process, Extreme programming; Other agile process models. Web Application Design: Web application design quality; Design quality and design pyramid; Interface design; Aesthetic design; Content design; Architecture design; Navigation design; Component-level design; Object-oriented hypermedia design method.

UNIT - II [10 Hours]

Formal Modeling and verification: The cleanroom strategy; Functional specification; Cleanroom design; Cleanroom testing; Formal methods: Concepts; Applying mathematical notation for formal specification; Formal specification languages. Software Project Management: The management spectrum; The management of people, product, process and project; The W5HH Principle; Critical practices. Estimation for Software Projects: Software project estimation; Decomposition techniques, Examples; Empirical estimation models; Estimation for Object-Oriented projects; Specialized estimation techniques; The make / buy decision.

UNIT - III [10 Hours]

Software Project Scheduling: Basic concepts and principles of project scheduling; Defining task set and task network; Scheduling; Earned value analysis. Risk Management: Reactive versus proactive strategies; Software risks; risk identification; Risk projection; Risk refinement; Risk mitigation, monitoring and management; The RMMM plan. Maintenance and Reengineering: Software maintenance; Software supportability; Reengineering; Business process reengineering; Software reengineering; Reverse engineering; Restructuring; Forward engineering; The economics of reengineering.

UNIT - IV [10 Hours]

Software Process Improvement (SPI): Approaches to SPI; Maturity models; The SPI process; The CMMI; The People CMM; Other SPI frameworks: SPICE, Bootstrap, PSP and TSP, ISO; SPI return on investment.

UNIT - V [10 Hours]

Software Configuration Management (SCM): Basic concepts; SCM repository; The SCM process; Configuration management for web applications; SCM standards. Product Metrics: A framework for product metrics; Metrics for requirements model, design model, source code, testing and maintenance; Design metrics for web applications. Process and Project Metrics: Basic concepts; Software measurement; Metrics for software quality; Integrating metrics within the software process; Metrics for small organizations; Establishing a software metrics program.

Reference

1. *Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Alternate Edition, 7th Edition, McGraw Hill, 2010.*
2. *Ian Sommerville, "Software Engineering", 8th Edition, Pearson, 2012.*

MCA404T: QUANTITAVE TECHNIQUES

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT - I [12 Hours]

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two phase method, degeneracy and unbound solutions.

UNIT - II [10 Hours]

Transportation Problem: Formulation, Solution, Unbalanced Transportation Problem. Finding Basic Feasible Solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method. Assignment Model: Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

UNIT - III [10 Hours]

Network Models: Definition, Minimum Spanning Tree algorithm, Shortest Route problem, Maximum flow problem. CPM & PERT: Network representation, Critical Path Computations, Linear Programming formulation of CPM, PERT Networks.

UNIT - IV [10 Hours]

Dynamic programming: Characteristics of dynamic programming. Dynamic Programming approach for Priority Management employment smoothening. Games Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

UNIT - V [10 Hours]

Queuing System: Elements of Queuing model, Pure birth and death models, Generalized Poission Queuing model, specialized poission. Queues: Steady-state Measure of performance, single sever models, Multiple server models, Matching serving model.

Reference

1. *J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.*
2. *P. Sankara Iyer, "Operations Research", Tata McGraw-Hill, 2008.*
3. *P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007. 4. H.A. Taha, "Operations Research", PHI, New Delhi. - 1996*

MCA405P: ADVANCED JAVA PROGRAMMING LAB

1. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
2. Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
3. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts
4. Write a Java Program to execute select query using JDBC
5. Write a Java Program to Create Thread using Interface and class.
6. Write a Java Program to Implement Producer and Consumer problem using Threads.
7. Write a Java Program to Implement DOM parser .
8. Write a Java Program to Implement SAX parser.
9. Write a Java Program to Implement Singleton design pattern using java.
10. Write a Java Program to Implement Factory and AbstractFactory design pattern using java.
11. Write a Java Program to Implement Observer Design pattern method using java.
12. Write a Java Program to Implement Adapter design design pattern using java
13. Write a Java Program to Implement proxy design pattern using java 14. Write a Java Program to Implement Helloworld program using servlets.
15. Write a JSP Program using Expression, Scriplet and Directive.

MCA406P: ADVANCED ALGORITHMS

1. Program to implement Bellman ford algorithm.
2. Program to implement Johnson algorithm.
3. Program to implement Ford-Fulkerson method
4. Program to solve Linear modular equation
5. Program to implement Rabin - Karp algorithm
6. Program to implement Knuth-Morris-Pratt algorithm
7. Program to implement Boyer – Moore algorithms.
8. Program to solve traveling-sales-person problem
9. Program to solve set covering problem
10. Program to solve Sum of subset problem.

MCA407T: SOFT SKILLS AND PERSONALITY DEVELOPMENT

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT – I [10 Hours]

Introduction to Soft Skills and Hard Skills, Break the ice berg –FEAR, Self Development - Etiquette and Manners. The Self Concept: Attitude, The process of attitude formation, positive attitude, How to build a success attitude, You are the chief architecture of yourself. Self Management Techniques. Believe in yourself: Self Image and Self Esteem, Building Self Confidence, Environment we mix with, How to build self-image.

UNIT - II [10 Hours]

Meaning and definition of personality, Personal Planning and Success Attitude: Prioritizing, Creating the master plan, Active positive visualization and Spot analysis. Self-Motivation and Communication: Levels of motivation, power of irresistible enthusiasm, etiquettes and manners in a group, public speaking, Importance of listening and responding.

UNIT - III [10 Hours]

Motivation Skills & Personality Development, Goal Setting, Career Planning, Resume Building, Psychometric Test, Priority Management & Time Management, Positive Attitude and Self Confidence. Verbal Communication includes Planning, Preparation Delivery, Feedback and assessment of activities like: Public speaking, Group Discussion, Oral Presentation skills, Perfect Interview, Listening and observation skills, body language and use of Presentation aids.

UNIT - IV [8 Hours]

Written communication that includes project proposals, brochures, newsletters, articles. Etiquettes that include: etiquettes in social as well as office settings, email etiquettes, telephone etiquettes. Improving Personal Memory, study skills that include rapid reading, notes taking and creativity.

UNIT - V [10 Hours]

Problem Solving and Decision Making Skills, Perceptive, Conceptual, Creative, Analytical and Decisive. Leadership as a process: co-ordination while working in a team, Leadership styles, Leader and Team player, Management of conflict, Profiles of great and successful personalities, Role of career planning in personality development, negotiation, Motivating.

Reference

1. *Wallace : Personality Development 1st Edition, 2008 Cengage Learning India.*
2. *Succeed for your self -Richard Denny (3rd edition) - Kogan page India www.vivagroupindia.com.*
3. *Unleashing Leadership – John Hoover & Angelo Valenti – Jaico publishing House –WWW.JAICOBOOKS.COM*
4. *Kundu, C.L - Personality development, Sterling Bangalore.*
5. *Listening and Responding – Sandra D.Collins-Cengage Learning India, 2nd Edition, 2008.*
6. *1,001 ways to inspire your organization, your team and your self – David E. Rye-Jaico publishing house, Career Press, 1998.*

FIFTH SEMESTER
MCA501T: ADVANCED WEB PROGRAMMING

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Perl, CGI Programming: Origins and uses of Perl; Scalars and their operations; Assignment statements and simple input and output; Control statements; Fundamentals of arrays; Hashes; References; Functions; Pattern matching; File input and output; Examples. The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

UNIT – II [10 Hours]

Servlets and Java Server Pages: Overview of Servlets; Servlet details; A survey example; Storing information on Clients; Java Server Pages. PHP: Origins and uses of PHP; Overview of PHP; General syntactic characteristics; Primitives, operations and expressions; Output; Control statements; Arrays; Functions; Pattern matching; Form handling; Files; Cookies; Session tracking.

UNIT – III [10 Hours]

Database Access through the Web: Relational Databases; An introduction to SQL; Architectures for Database access; The MySQL Database system; Database access with PERL and MySQL; Database access with PHP and MySQL; Database access with JDBC and MySQL.

UNIT – IV [10 Hours]

Introduction to Ruby, Rails: Origins and uses of Ruby; Scalar types and their operations; Simple input and output; Control statements; Fundamentals of arrays; Hashes; Methods; Classes; Code blocks and iterators; Pattern matching. Overview of Rails; Document requests; Processing forms; Rails applications with Databases; Layouts.

UNIT – V [10 Hours]

Introduction to Ajax: Overview of Ajax; The basics of Ajax; Rails with Ajax.

Reference

1. *Robert W. Sebesta: "Programming the World Wide Web", 4th Edition, Pearson Education, 2012.*
2. *M. Deitel, P.J. Deitel, A. B. Goldberg: "Internet & World Wide Web How to program", 3rd Edition, Pearson Education, 4th edition, PHI, 2011.*
3. *Chris Bates: "Web Programming Building Internet Applications", 3rd Edition, Wiley India, 2011.*
4. *Joyce Farrell, Xue Bai, Michael Ekedahl: "The Web Warrior Guide to Web Programming", 1st edition, Thomson, 2010.*

MCA502T: ADVANCED DATABASE MANAGEMENT SYSTEMS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

NOSQL and Query Optimization: Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MongoDB Basics: NOSQL Storage architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering data sets (MongoDB/CouchDB/Cassandra). Advanced NOSQL, NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive. Working with NOSQL:, Query Optimization: Overview ,Transformation of Relational Expressions, Estimating Statistics of Expression Choice of Evaluation Plans, Materialized views Advanced Query Optimization: Motivation, Query Processing Phases, Logical Query Optimization.

UNIT – II [10 Hours]

SAN: Introduction to Information Storage and Management, Data Center Infrastructure, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance. Data Protection, Intelligent Storage system: Implementation of RAID, RAID Array Components, RAID Levels, RAID Impact on Disk Performance.

UNIT – III [10 Hours]

Data Warehousing and Data Mining: Data Warehouse Architecture, Data Warehouse Implementation, Mining Methods, Mining Various Kinds of Association Rules. Data Mining: Data Mining Applications, Social Network Analysis;

UNIT – IV [10 Hours]

Big Data: Introduction to principles and practice of systems that improve performance through experience. Topics include statistical learning framework, supervised and unsupervised learning, performance evaluation and empirical methodology; design tradeoffs. Introduction to the Big Data problem. Current challenges, trends, and applications Algorithms for Big Data analysis. Mining and learning algorithms that have been developed specifically to deal with large datasets Technologies for Big Data management. Big Data technology and tools, special consideration made to the Map-Reduce paradigm and the Hadoop ecosystem.

UNIT - V [10 Hours]

Information Retrieval and Search Engines: Architecture of search engine, Ranking and Evaluation; CRAWLS AND FEEDS: Crawling the Web, Directory Crawling, Conversion Problem, Storing the Documents, Detecting Duplicates. Processing text: Text Statistics, Document Parsing, Document Structure and Markup, Link Analysis, Information Extraction, Internationalization; RANKING WITH INDEXES: Inverted indexes, Compression, Entropy and Ambiguity, Delta Encoding, Bit-aligned codes, Auxiliary Structures, Index Construction, Query Processing.

Reference

1. *"Professional NOSQL" by Shashank Tiwari, 2011, WROX Press The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing,by Eelco Plugge, Tim Hawkins, Peter Membrey Apress 2010*
2. *"NoSQL Handbook" by Mathias Meyer, 2011 Paperplanes.*
3. *MongoDB: The Definitive Guide, 2nd Edition,by Kristina Chodorow 2013 Silberschatz, Korth and Sudharshan Andreas Meister Otto-von-Guericke University Magdeburg*
4. *G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management: Storing, Managing & Protecting Digital Information in Classic, Visualized and Cloud Environments, 2 nd edition, EMC Education Services, Wiley- India, 2009. ISBN 978-1- 1180-9483-9*
5. *Jiawei Han and Micheline Kamber, Data Mining, Concepts and Techniques, Morgan Kaufmann Publisher, II Edition, 2006.*
6. *Machine Learning, Tom Mitchell. ISBN-10: 0070428077 | ISBN-13: 978-0070428072 | Edition: 1 (optional)*
7. *Hadoop Real World Solutions Cookbook by Jonathan R. Owens, Brian Femiano, and Jon Lentz Publication Date: February 7, 2013 | ISBN-10: 1849519129 | ISBN-13: 978- 1849519120*
8. *Search Engines: Information Retrieval in Practice: Trevor Strohman, Bruce Croft Donald Metzler, Kindle Edition, Pearson Education, 2011.*

MCA503T: ARTIFICIAL INTELLIGENCE

Total Teaching Hours: 52 No. of Hours / Week : 04

UNIT-I [12 Hours]

Introduction to Artificial Intelligence: Definition, AI Applications, AI representation, Properties of internal Representation, Heuristic search techniques. Best first search, mean and end analysis, A* and AO* Algorithm, Game Playing, Minimize search procedure, Alpha beta cutoffs, waiting for Quiscence, Secondary search.

UNIT-II [10 Hours]

Knowledge representation using predicate logic: predicate calculus, Predicate and arguments, ISA hierarchy, frame notation, resolution, Natural deduction. Knowledge representation using non monotonic logic: TMS (Truth maintenance system), statistical and probabilistic reasoning, fuzzy logic, structure knowledge representation, semantic net, Frames, Script, Conceptual dependency.

UNIT-III [10 Hours]

Planning: block world, strips, Implementation using goal stack, Non linear planning with goal stacks, Hierarchical planning, list commitment strategy. Perception: Action, Robot Architecture, Vision, Texture and images, representing and recognizing scenes, waltz algorithm, Constraint determination, Trihedral and non trihedral figures labeling.

UNIT-IV [10 Hours]

Learning: Learning as induction matching algorithms. Failure driver learning, learning in general problem solving concept learning. Neural Networks: Introduction to neural networks and perception-qualitative Analysis only, neural net architecture and applications.

UNIT-V [10 Hours]

Natural language processing and understanding and pragmatic, syntactic, semantic, analysis, RTN, ATN, understanding sentences. Expert system: Utilization and functionality, architecture of expert system, knowledge representation, two case studies on expert systems.

Reference

1. *E. Charnaik and D. McDermott," Introduction to artificial Intelligence",Pearson Education, 2012.*
2. *Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI, 2013.*
3. *E. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill, 2013.*
4. *Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publishing Co. 2002.*

MCA505P: ADVANCED WEB PROGRAMMING LAB

1. Develop and demonstrate a XHTML file that includes Javascript script to generate first n Fibonacci numbers.
2. Develop and demonstrate the usage of inline and external style sheet using CSS
3. Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
4. Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
5. Design an XML document to store information about a student in a college affiliated to BU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
6. Write a Perl program to display a digital clock which displays the current time of the server.
7. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
8. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
9. Write a PHP program to read student data from an XML file and store into the MYSQL database. Retrieve and display.
10. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a CGI-Perl program to use a cookie to remember the day of the last login from a user and display it when run.
12. Write a Perl program to display various Server informations like Server Name, Server Software, Server protocol, CGI Revision etc.
13. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
14. Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

MCA506P: MINI PROJECT

The students are supposed to develop a mini – project for above mentioned lab. The students can do the project in a group (team) consisting of not more than 2 students. A project report must be submitted by each team.

SIXTH SEMESTER

ELECTIVES

MCA6E1: DISTRIBUTED OPERATING SYSTEMS

Total Teaching Hours: 52 No. of Hours / Week : 04

UNIT – I [12 Hours]

Fundamentals: What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE). Message Passing: Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism.

UNIT – II [10 Hours]

Remote Procedure Calls: Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.

UNIT – III [10 Hours]

Distributed Shared Memory: Introduction, General Architecture of DSM Systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms.

UNIT – IV [10 Hours]

Resource Management: Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach Process Management: Introduction, Process Migration, Threads.

UNIT – V [10 Hours]

Distributed File Systems: Introduction, Desirable Features of a Good Distributed File System, File models, File– Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions, Design Principles.

Reference

1. *Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.*
2. *Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.*

MCA6E2: SOFTWARE TESTING

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [12 Hours]

Basics of Software Testing and Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudo code, The triangle problem, The Next Date function, The commission problem, The SATM (Simple Automatic Teller Machine) problem. Decision Table-Based Testing: Decision tables, Test cases for the triangle problem, Test cases for the Next Date function, Test cases for the commission problem, Guidelines and observations. Data Flow Testing: Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT – II [10 Hours]

Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. Integration Testing: A closer look at the SATM system, Decomposition-based, call graph- based, Path-based integrations, Case study. System Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example.

UNIT – III [10 Hours]

Interaction Testing: Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing. Issues in Object-Oriented Testing: Units for object-oriented testing, Implications of composition and encapsulation, inheritance, and polymorphism, Levels of object-oriented testing, GUI testing, Dataflow testing for object-oriented software, Examples. Class Testing: Methods as units, Classes as units.

UNIT – IV [10 Hours]

Object-Oriented Integration Testing: UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow integration testing. GUI Testing: The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program. Object-Oriented System Testing: Currency converter UML description, UML-based system testing, State chart-based system testing. Exploratory Testing: The context-driven school, Exploring exploratory testing, Exploring a familiar example, Exploratory and context-driven testing observations.

UNIT – V [10 Hours]

Model-Based Testing: Testing based on models, Appropriate models, Use case-based testing, Commercial tool support for model-based testing. Test-Driven Development: Test-then-code cycles, Automated test execution, Java and JUnit example, Remaining questions, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD. A Closer Look at All Pairs Testing: The all-pairs technique, A closer look at NIST study, Appropriate applications for all pairs testing, Recommendations for all pairs testing. Software Testing Excellence: Craftsmanship, Best practice of software testing,

Top 10 best practices for software testing excellence, Mapping best practices to diverse projects.

Reference

1. *Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2012.*
2. *Aditya P Mathur: Foundations of Software Testing, Pearson, 2008.*
3. *Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, 1st edition, John Wiley & Sons, 2011.*
4. *Srinivasan Desikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 1st Edition, Pearson, 2012.*
5. *Brian Marrick: The Craft of Software Testing, 1st edition, Pearson, 2012.*

MCA6E3: PARALLEL ALGORITHMS

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT- I [12 Hours]

INTRODUCTION: Introduction to Parallel Algorithms – Models of Parallel Computation – Sorting on an EREW- SIMDPRAM Computer – Relation between PRAM Models – SIMD Algorithms – MIMD Algorithms –Selection – Desirable Properties for Parallel Algorithms - Parallel Algorithm for Selection –Analysis of Parallel Algorithms.

UNIT - II [10 Hours]

SORTING AND SEARCHING: Merging on the EREW and CREW Models - Fast Merging on EREW - Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW Models – Searching a Sorted Sequence –Searching a Random Sequence.

UNIT- III [10 Hours]

ALGEBRAIC PROBLEMS: Generating Permutations and Combinations in Parallel – Matrix Transpositions – Matrix by Matrix Multiplications – Matrix by Vector multiplication.

UNIT- IV [10 Hours]

GRAPH THEORY AND COMPUTATIONAL GEOMETRY PROBLEMS: Connectivity Matrix – Connected Components – All Pairs Shortest Paths – Minimum Spanning Trees – Point Inclusion – Intersection, Proximity and Construction Problems - Sequential Tree Traversal - Basic Design Principles – Algorithm – Analysis.

UNIT - V [10 Hours]

DECISION AND OPTIMIZATION PROBLEMS: Computing Prefix Sums – Applications - Job Sequencing with Deadlines – Knapsack Problem- The Bit Complexity of Parallel Computations.

Reference

1. *Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall, New Jersey, 2009.*
2. *Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, 2013.*
3. *Justin R. Smith, "The Design and Analysis of Parallel Algorithms", Oxford University Press, USA , 2003.*
4. *Joseph JaJa, "Introduction to Parallel Algorithms", Addison-Wesley, 2002.*

MCA6E4: COMPILER DESIGN

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT-I [10 Hours]

Introduction to compiler- Complier and Translators-Phases of Compilation-One pass compiler, Lexical Analysis-Role of Lexical Analyzer-Regular expressions-Finite Automata-Design of lexical Analyzer- Context free grammars-Parse trees.

UNIT-II [07 Hours]

Parsers-Shift reduce parsing-Operator precedence parsing-Top down parsing Predictive parsers-Simple precedence parsers-LR parsers-SLR parser tables-LALR parsing tables-Ambiguous grammars.

UNIT-III [10 Hours]

Syntax directed translation-Construction of syntax trees-Evaluation of S attributed and L attributed definitions-Top down Translation-Recursive evaluators, Type checking-Simple type checker-Type conversions- Overloading of functions and operators-Polymorphic functions, Run time environment –Source language issues-Storage organization-Storage Allocation-symbol tables-Dynamic storage allocation techniques.

UNIT-IV [15 Hours]

Intermediate code generation-Languages-Declarations-Assignment statements-Boolean expression-Case statements- Backpatching-Procedure Calls, code optimization-Sources of optimization-Basic blocks-Loops-Global Data Flow analysis- Solution of data flow equations- Code improving transformations-Dealing with aliases-Data Flow analysis of flow graphs-Symbolic debugging of optimized code, Code generations-Issues in the design of code generator- Simple code generator Register allocation and assignment-DAG representations-PEE hole optimization- generation of code from DAG's-Code generation algorithm.

UNIT-V [10 Hours]

Approaches to compiler development-Complier environment- Testing and Maintenance Compiler for Pascal-Complier for C.

Reference:

1. *A.V.Aho Ravi Sethi and J.D Ullman : " The Principles of Compiler Design", Narosa Publishing House, 2007*
2. *D.M.Dhamdhere : "Compiler Construction, Principles and Practice", McMillian India Ltd., 2013*

MCA6E5: MULTIMEDIA COMMUNICATION

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT-I [06 Hours]

Introduction: What are multimedia, multimedia application, Goal and objectives, Multimedia building blocks, multimedia and internet

UNIT-II [12 Hours]

Multimedia Configuration: Multimedia PC workstation components, multimedia platform, multimedia development tool, authoring tool, Interactivity, High end multimedia architectures. MULTIMEDIA OPERATING SYSTEM File system (File format: TIEF, BMP, PCX, GIF etc.) Process management, multimedia communication system, multimedia database management system. Multimedia Audio: Basic sound concepts, audio capture, music, speech sound processor, sound recovery technique, VOC4WAV file formats for sound.

UNIT-III [14 Hours]

Multimedia graphics: 2D/3D animation fundamentals, color modules DIGITAL IMAGING: still and moving images; video capture animation video, Processing, video Recovery techniques, AVO, AVI file formats, NTSC, PAL, SECAM, HDTV, system video/audio conferencing techniques and standards, video streaming, motion of synchronization.

UNIT-IV [10 Hours]

Image Compression techniques: LZW, DCT run length coding, JPEG, MPEG, standard hypertext MHEG, Hypertext and Hypermedia, document architecture ODA, MHEG. Augmented and virtual reality and multimedia: Concept, VR devices: hand Gloves, head mounted tracking system, V R Chair, CCD, VCR ,3D, sound system, Head Mounted Displays and rendering software setup, Virtual objects, VRML.

UNIT-V [10 Hours]

Multimedia devices: Mass storage systems for multimedia requirements, Magnetic devices, Optical devices, CDROM, DVD. Scanners: Types and specifications. Windows support to Multimedia: Multimedia Databases (in Oracle), multimedia function calls, windows support for sound, animation, movies, music and midi controls. Multimedia and UNIX, Virtual Coffee house application.

Reference

1. *Ralf Steinmetz & Klara Nahr Stedt, PHI Publications: Multimedia - Computing, Communications and Applications. 2003*
2. *Judith Jefcoate, Multimedia in Practice: Technology and Application PHI 2008.*
3. *Durano R Begault, Virual Reality and Multimedia, AP Professionals. 2003*
4. *Micheal J Young, Windows multimedia and animation with C++ programming for Win95, AP Professional. 2004*

MCA6E6: E-GOVERNANCE

Total Teaching Hours: 52 No. of Hours / Week : 04

UNIT – I [12 Hours]

Introduction to e- Governance, Different Stages of e-Governance, Advantages, Problems and Challenges of e-Governance, National Statues, International Status, Securities in e-Governance.

UNIT – II [10 Hours]

National e-Governance Plan, Government of India guidelines for websites, W3C guidelines, web 2.0, web 3.0

UNIT – III [10 Hours]

Different UN Survey on e-Governance, UN Survey on e-Governance – 2014, e-Government Act, 2002, Adhaar Bill, 2016, II Administrative Reforms Committee Report 11, Digital India Programme, IT Act, 2008 Section 1 to 11A, Section 43 and 66

UNIT – IV [10 Hours]

Workflow Management in e-Governance, Digital Divide, Mechanism to handle Digital Divide, Bridge the digital divide, M-Governance, e-Learning, Role of Social Media in e-Governance, Big data Analytics in e-Governance, Semantic web Analytics.

UNIT – V [10 Hours]

Case Study: Election Commission, Indian Railway Reservation, Addhar – UID, Income Tax, SAKALA, Bhoomi, e-Commission, CET admission, Centralized Admission, Student Scholarship Management.

Reference

1. *Mishra D.S (2007). E-Governance as reform strategy for combating corruption in delivery of public services. Indian Journal of Public Administration. LIII (3).*
2. *Bhogle Srinivas (2009). E-Governance. Selected Readings on Information Technology Management: Contemporary Issues ed. George Kelley. Information Science Reference, New York.*
3. *Bhuiyan H Shahjahan (2011). Modernizing Bangladesh public administration through e-governance: Benefits and challenges. 28, 54-65.*
4. *The World Wide Web Consortium (2008). Web Content Accessibility Guidelines (WCAG) 2.0. Downloaded on 10th January, 2012 from http://www.w3.org/*
5. *Government of India (2009). Guidelines for Indian Government websites. Downloaded on 15th January, 2012 from http://darpg.nic.in/*
6. *e-Government Act (2002). https://www.gpo.gov/fdsys/pkg/PLAW-107publ347/pdf/PLAW-107publ347.pdf*
7. *Digital India Programme. http://www.digitalindia.gov.in/*
8. *Information Technolgy Act, 2008. http://www.dot.gov.in/act-rules/information-technology-act-2000*
9. *Second Adminstrative Reforms Committee Report. Report 11: Promoting e-Governance: The SMART way Forwardhttp://arc.gov.in/*

10. *UN Survey on e-Governmen, 2014 (or latest). https://publicadministration.un.org/egovkb/portals/egovkb/documents/un/2014-survey/e-gov_complete_survey-2014.pdf*
11. *The Adhaar Bill, 2016. http://www.prsindia.org/billtrack/the-aadhaar-targeted-delivery-of-financial-and-other-subsidies-benefits-and-services-bill-2016-4202/*

MCA6E7: DIGITAL IMAGE PROCESSING

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT-I [12 Hours]

DIGITAL IMAGE FUNDAMENTALS: Origin of Digital Image processing – fundamental steps –Components of Image Processing system –Visual perception –Light and EM spectrum –Image sensing and acquisition –Image sampling and Quantization – relationship between pixels, Two-Dimensional Mathematical Preliminaries

UNIT - II [10 Hours]

IMAGE ENHANCEMENT: Spatial Domain: Gray level transformation –Histogram processing –Arithmetic / Logic operations- Spatial filtering –smoothing filters – sharpening filters Frequency Domain: Fourier transform –smoothing frequency domain filters –sharpening filters –Homographic filtering

UNIT - III [10 Hours]

IMAGE RESTORATION: Image Restoration - Degradation Model, Unconstrained Restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT- IV [10 Hours]

IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, Basic Concepts, Dam Construction, Watershed segmentation algorithm.

UNIT- V [10 Hours]

IMAGE COMPRESSION: Need for data compression, Fundamentals –Image compression models Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Reference

1. *Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.*
2. *Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.*
3. *Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.*
4. *Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.*
5. *D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990*
6. *William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002*
7. *Milan Sonka et aI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999*

MCA6E8: MOBILE COMPUTING

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT – I [12 Hours]

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

UNIT -II [10 Hours]

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

UNIT – III [10 Hours]

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

UNIT– IV [10 Hours]

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

UNIT– V [10 Hours]

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Reference

1. *J. Schiller, Mobile Communications, Addison Wesley, 2009.*
2. *A. Mehrotra, GSM System Engineering, Artech House, 1997.*
3. *M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House, 2011.*
4. *Charles Perkins, Mobile IP, Addison Wesley, 2010.*
5. *Charles Perkins, Ad hoc Networks, Addison Wesley, 2009.*

MCA6E9: TCP/IP

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT I [12 Hours]

INTRODUCTION: Internetworking concepts and architecture model – classful Internet address – CIDR –Subnetting and Supernetting – AARP – RARP- IP- IP Routing – ICMP – IPV6.

UNIT II [10 Hours]

TCP: Services – header – connection establishment and termination – interactive data flow bulk data flow – timeout and retransmission – persist timer – keep alive timer – futures and performance.

UNIT III [10 Hours]

IP IMPLEMENTATION: IP global software organization – routing table – routing algorithms – fragmentation and reassembly – error processing (ICMP) – Multicast Processing(IGMP).

UNIT IV [10 Hours]

TCP IMPLEMENTATION I: Data structure and input processing – transmission control blocks – segment format –comparison – finite state machine implementation Output processing – mutual exclusion – computing the TCP Data length.

UNIT V [10 Hours]

TCP IMPLEMENTATION II**:** Timers – events and messages – timer process – deleting and inserting timer event –flow control and adaptive retransmission – congestion avoidance and control – urgent data processing and push function.

Reference

1. *Douglas E Comer,"Internetworking with TCP/IP Principles,Protocols and Architecture",Vol 1 and 2, Vth Edition*
2. *W.Richard Stevans "TCP/IP Illustrated" Vol 1.2003.*
3. *Forouzan, " TCP/IP Protocol Suite" Second Edition, Tate MC Graw Hill, 2003.*
4. *W.Richard Stevens "TCP/IP Illustrated" Volume 2, Pearson Education 2003*

MCA6E10: CLOUD COMPUTING

Total Teaching Hours: 52 No. of Hours / Week: 04

UNIT – I [10 Hours]

Introduction: Essentials, Benefits and need for Cloud Computing - Business and IT Perspective - Cloud and Virtualization - Cloud Services Requirements - Cloud and Dynamic Infrastructure - Cloud Computing Characteristics Cloud Adoption. Cloud Models: Cloud Characteristics - Measured Service - Cloud Models - Security in a Public Cloud Public versus Private Clouds.

UNIT - II [6 Hours]

Cloud Infrastructure Self Service. Cloud as a Service: Gamut of Cloud Solutions - Principal Technologies - Cloud Strategy Cloud Design and Implementation using SOA - Conceptual Cloud Model - Cloud Service Defined.

UNIT – III [14 Hours]

Cloud Solutions: Cloud Ecosystem - Cloud Business Process Management - Cloud Service Management - Cloud Stack - Computing on Demand (CoD) – Cloud sourcing. Cloud Offerings: Information Storage, Retrieval, Archive and Protection - Cloud Analytics Testing under Cloud - Information Security - Virtual Desktop Infrastructure - Storage Cloud. Cloud Management: Resiliency – Provisioning - Asset Management - Cloud Governance - High Availability and Disaster Recovery - Charging Models, Usage Reporting, Billing and Metering.

UNIT – IV [10 Hours]

Cloud Virtualization Technology: Virtualization Defined - Virtualization Benefits - Server Virtualization - Virtualization for x86 Architecture - Hypervisor Management Software - Logical Partitioning (LPAR) - VIO Server - Virtual Infrastructure Requirements. Cloud Virtualization: Storage virtualization - Storage Area Networks - Network-Attached storage - Cloud Server Virtualization - Virtualized Data Center.

UNIT – V [12 Hours]

Cloud and SOA: SOA Journey to Infrastructure - SOA and Cloud - SOA Defined - SOA and IaaS - SOA-based Cloud Infrastructure Steps - SOA Business and IT Services. Cloud Infrastructure Benchmarking: OLTP Benchmark - Business Intelligence Benchmark - e- Business Benchmark - ISV Benchmarks - Cloud Performance Data Collection and Performance Monitoring Commands - Benchmark Tools.

Reference

1. *Cloud Computing – Insight into New Era Infrastructure, Dr. Kumar Saurabh, Wiley India, 2011.*
2. *Cloud Computing, Roger Jennings, Wiley India, 2009.*
3. *Cloud Computing Explained, John Rhoton, Recursive Press,2009.*
4. *Cloud Computing Bible, Barry Sosinsky, Wiley, 2011.*

5. *Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Wiley, 2011.*
6. *Cloud Computing for Dummies, Judith Hurwiz, Wiley Publishing, 2009.*
7. *The Cloud at your service, Rosenberg and Matheos, Manning Publications, 2010.*

MCA6E11: STORAGE AREA NETWORK

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT – I [10 Hours]

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access.

UNIT – II [12 Hours]

Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems. I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage.

UNIT – III [10 Hours]

Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Sotfware Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

UNIT – IV [10 Hours]

Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network. SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.

UNIT – V [10 Hours]

Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs. Management: Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations.

Reference

1. *Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2007.*
2. *Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.*
3. *Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2003.*
4. *Richard Barker and Paul Massiglia: "Storage Area Network Essentials A CompleteGuide to understanding and Implementing SANs", Wiley India, 2006.*

MCA6E12: Data Mining

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT – I [10 Hours]

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

UNIT -II [10 Hours]

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

UNIT – III [10 Hours]

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

UNIT– IV [10 Hours]

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

UNIT – V [12 Hours]

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K- nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Reference

1. *M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education,2013*
2. *Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier, 2013.*

3. *Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, 1/e", Pearson Education. 2009.*
4. *Mallach,"Data Warehousing System", McGraw –Hill, 2008.*

MCA6E13: BIG DATA ANALYTICS

Total Teaching Hours: 52 No of Hours / Week: 04

UNIT – I [12 Hours]

UNDERSTANDING BIG DATA: What is big data – why big data, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

UNIT- II [10 Hours]

NOSQL DATA MANAGEMENT: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding — version – Map reduce – partitioning and combining – composing map-reduce calculations

UNIT -III [10 Hours]

BASICS OF HADOOP: Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

UNIT –IV [10 Hours]

MAPREDUCE APPLICATIONS: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT- V [10 Hours]

HADOOP RELATED TOOLS: Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

Reference

1. *Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.*
2. *Eric Sammer, "Hadoop Operations", O'Reilley, 2012.*
3. *Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.*
4. *E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.*
5. *Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.*
6. *Alan Gates, "Programming Pig", O'Reilley, 2011.*

MCA603P: Main Project

The students are supposed to develop a main – project for above mentioned lab. The students should do the individual project. A project report must be submitted by each students. The students needs to copy out the project for four days in a week, and two days needs to attend the classwork.

BANGALORE UNIVERSITY
MCA PROGRAMME

Open Elective: "Cyber Space"

Objectives: To understand cyber space, social media in cyber space, advantages, disadvantages, IT Act 2000/2008, Digital Signature, Electronic Signature, e-commerce, and e-governance

Unit I: Basics of internet, www, http, html, DNS, IP Address, electronic mail, web browsers, search engines, Social Media: Twitter, Facebook, Youtube, whatsapp, LinkedIn, advantages, disadvantages, privacy issues

Unit II: e-commerce, advantages of e-commerce, survey on popular e-commerce sites

Unit III: Introduction to e-governance, stages of e-governance, advantages, challenges, International Status, Indian status

Unit IV: IT Act, 2000 salient features, digital signature, electronic signature, Cyber Appellate Tribunal, Adjudicator, offences, and penalties.

Reference

1. *Information Technology Amended Act, 2008, Ministry of Law and Justice, Government of India.*
2. *SrinivasBhogle, "E-Governance" Chapter III in Selected Readings on Information Technology Management : Contemporary Issues, Information Science reference, Hershey, New York, page no. 40-61.*
3. *Tom Huskerson. Social Media, the Good, Bad, and Ugly: Volume. 3. 2014*
4. *RitendraGoel. "e-commerce", New Age International Publishers, 2008*
5. *Dougals E Comer. Computer Network and Internet. Pearson, 2008*