

I.K.G PUNJAB TECHNICAL  
UNIVERSITY  
KAPURTHALA

Scheme and Syllabus  
of  
Masters in Computer Applications (MCA)  
Batch 2015 July onwards

By  
Board of Studies Computer Applications

First Semester Contact Hours: 34 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA101	Information Management	4	1	-	40	60	100	5
MCA102	Object Oriented Programming in C++	4	1	-	40	60	100	5
MCA103	Computer Organization and Assembly Language	4	1	-	40	60	100	5
MCA104	Accounting & Financial Management	4	1	-	40	60	100	5
MCA105	Technical Communication	3	1	2	40	60	100	5
MCA106	Software Lab-I (Information Management)	-	-	4	60	40	100	2
MCA107	Software Lab –II (Object Oriented Programming in C++)	-	-	4	60	40	100	2
Total		19	5	10	320	380	700	29

\* There will be no practical examination for Technical Communication. Faculty must include the Performance in internal assessment of theory.

Second Semester Contact Hours: 35 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA201	Mathematical Foundations of Computer Science	4	1	-	40	60	100	5
MCA202	Relational Database Management System	4	1	-	40	60	100	5
MCA203	Data Structures	4	1	-	40	60	100	5
MCA204	Data Communication and Networks	4	1	-	40	60	100	5
MCA205	Linux Operating System	4	1	-	40	60	100	5
MCA206	Software Lab –III (Relational Database Management System)	-	-	4	60	40	100	2
MCA207	Software Lab –IV (Data Structures)	-	-	4	60	40	100	2
MCA208	Software Lab –V (Based on-Linux Operating System)	-	-	2	60	40	100	1
Total		20	5	10	380	420	800	30

Third Semester Contact Hours: 33Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA301	Database Administration	4	1	-	40	60	100	5
MCA302	Information security	4	1	-	40	60	100	5
MCA303	Software Engineering & Project Management	4	1	-	40	60	100	5
MCA304	Java Programming	4	1	-	40	60	100	5
MCA305	Elective	4	1	-	40	60	100	5
MCA306	Software Lab-VI [Database Administration]	-	-	4	60	40	100	2
MCA307	Software Lab-VII [Java Programming]	-	-	4	60	40	100	2

Fourth Semester Contact Hours:32Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA401	Mobile Application Development	4	1	-	40	60	100	5
MCA402	E-Commerce & Web Application Development	4	1	-	40	60	100	5
MCA403	Interactive Computer Graphics	4	1	-	40	60	100	5
MCA404	Advanced Operating Systems	4	1	-	40	60	100	5
MCA405	Software Lab-VIII (Web& Mobile Application Development)	-	-	6	60	40	100	3
MCA406	Software Lab-IX (Interactive Computer Graphics)	-	-	4	60	40	100	2
Total		16	4	10	280	320	600	25
* Students will undergo 6-8 weeks industrial training after 4 <sup>th</sup> semester. Examination will be conducted along with 5 <sup>th</sup> semester practical.								

Fifth Semester Contact Hours: 32Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA501	Artificial Intelligence	4	1	-	40	60	100	5
MCA502	Design and analysis of algorithms	4	1	-	40	60	100	5
MCA503	Web Technologies	4	1	-	40	60	100	5
MCA504	Object Oriented Analysis& Design with UML	4	1	-	40	60	100	5
MCA505	Software Lab–XI(Web Technologies)	-	-	4	60	40	100	2
MCA506	Software Lab–XII(Object Oriented Analysis and Design with UML)	-	-	4	60	40	100	2
MCA507	Industrial Training*	-	-	-	-	-	-	S/U
Total		16	4	8	280	320	600	24

## Sixth Semester

Contact Hours:34Hrs

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA601	Data Warehousing & Mining	4	1	-	40	60	100	5
MCA602	Cloud Computing	4	1	-	40	60	100	5
MCA603	Advanced Computer Architecture	4	1	-	40	60	100	5
MCA604	Software Testing & Quality Management	4	1	-	40	60	100	5
MCA605	Software Lab- XIII (Software Testing)	-	-	2	60	40	100	1
MCA606	Project	-	-	8	180	120	300	8
Total		16	4	10	400	400	800	29

List of Electives:

Course Code	(MCA305) Elective	Course Code	(MCA305)Elective
MCA305A	System Programming	MCA305C	Embedded system
MCA305B	Theory of Computation		

## MCA-101 Information Management

### Section-A

Introduction to Information Technology - Definition, Applications in various sectors, Different types of software, Generations of Computers, Input and output Devices, Various storage devices like HDD, Optical Disks, Flash Drives. Different Types of data file formats: Types and Applications.

### Section-B

IT Infrastructure in India– Telecommunication, Internet research and Broadband

Data Collection and Data Management, Data Models, Information vs. Knowledge, Various techniques to derive information, Information Management.

### Section–C

Management Information System–Definition, Strategic Management of Information, Decision Making, Development Process of MIS, Strategic Design of MIS, Business Process Reengineering.

Understanding Knowledge Management, Designing a Knowledge Management System, Nature and Scope of Business Intelligence, Information Security- Meaning and Importance, Organizational Security Policy and Planning, Access Control and Operations Security.

### Section–D

Office Automation (Word processing, Spreadsheet, Presentation, E-Mail Clients), Content Management System and Architecture.

### **Suggested Readings/Books:**

1. Introduction to Information Technology, Second Edition, Turban, Rainer, Potter, WSE, Wiley India.
2. Data Warehousing Fundamentals: A Comprehensive Study for IT Professionals, Paulraj Ponnian BWSTN, Wiley India.
3. Information Assurance For The Enterprise: A Roadmap To Information Security-Corey Schou, Daniel Shoemaker, Mc-Graw Hill Publications.
4. Management Information System: Text And Cases, Waman Jawadekar, Mc-Graw Hill Publications.



## MCA-102 Object Oriented Programming in C++

### Section-A

Evolution of OOP, OOP Paradigm, advantages of OOP, Comparison between functional programming and OOP Approach, characteristics of object oriented language – objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading. Introduction to C++, Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, features of iostream.h and iomanip.h input and output, conditional expression loop statements, breaking control statements.

### Section-B

Defining function, types of functions, storage class specifiers, recursion, pre-processor, header files and standard functions, Arrays, pointer arithmetic's, structures, pointers and structures, unions, bit fields typed, enumerations. Passing array as an argument to function.

### Section-C

Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors, inline member functions, static class member, friend functions, dynamic memory allocation. Inheritance, single inheritance, types of base classes, types of derivations, multiple inheritance, container classes, member access control.

### Section-D

Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, virtual destructors, late binding, pure virtual functions, opening and closing of files, stream state member functions, binary file operations, structures and file operations, classes and file operations, random access file processing. Exception Handling.

### Suggested Readings/Books:

1. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia Publications, 1994.
2. The C++ Programming Language, Bjarne Wesley Publications, 1994.
3. Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill
4. Object Oriented Software Engineering, S.Halladay and M.Wiebel, BPBPublications, 1995.



## MCA-103 Computer Organization and Assembly Language

### Section-A

Computer Organization: Basic Computer Organization, Bus & Memory Transfer, Stored Program Organization, Computer Registers, Computer Instructions, Timing and Control, Hardwired based design of Control Unit, Instruction Cycle, Formats of Various types of Instructions-Memory Reference Instructions, Register Reference Instructions & I/O Instructions, General Register Organization-Control word, Design of Adder & Logic Unit, Stack Organization-Register Stack, Memory Stack, Reverse Polish Notation, Addressing Modes, RISC vs CISC Architectures, Interrupts & types.

### Section-B

Pipeline & Vector Processing: Parallel Processing, Pipelining-Arithmetic & Instruction Pipeline, Vector Processing-Vector operations, Memory Interleaving, Array Processors.

Input – Output Organization: Input-Output Interface- I/O vs Memory Bus, Isolated vs Memory mapped I/O, Synchronous Data Transfer, Asynchronous Data Transfer – Strobe Control, Handshaking, Asynchronous Communication Interface, Modes of Transfer-Programmed I/O, Interrupt Initiated I/O, Interrupt Cycle, Priority Interrupt Controller, DMA Controller & DMA Transfer.

### Section-C

Memory Organization: Main Memory- Memory Address Map, Memory connection to CPU, Associative Memory-Hardware organization, Match Logic, Cache Memory-Levels of

Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping, writing Into Cache,

Cache coherence, Virtual Memory – Address space & Memory space, Address mapping using

pages, Associative memory page table, Page replacement. Memory Management Hardware–

Segmented page mapping, Multiport memory, Memory protection.

## Section-D

Multi processors: Characteristics of Multiprocessors, Interconnection structures-Time Shared Common Bus, Crossbar switch, Multistage Switching Network, Hypercube interconnection, Inter processor communication & synchronization.

Assembly Language Programming : Example of a typical 8 bit processor (8085 microprocessor) — Registers, Addressing modes, Instruction Set-Data transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Machine Control Instructions, Use of an Assembly Language for specific programmes: Simple numeric manipulations, Sorting of a list and use of I/O instructions.

### **Suggested Readings/Books:**

1. Computer Organization- Car Hamacher, Zvonks Vranesic, Safwat Zaky, V Edition, McGraw Hill.
  2. Computer System Architecture, Mano, M.M., 1986: Prentice Hall of India. Computer Architecture and Organization, John Paul Hayes: McGraw-Hill International Edition
  3. Structured Computer Organization, Tanenbaum, A.S.: Prentice Hall of India.
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## MCA-104 Accounting and Financial Management

### Section-A

Accounting: Principles, concepts and conventions, double entry system of accounting, introduction to basic books of accounts of sole proprietary concern, partnership, organization & company, closing of books of accounts and preparation of trial balance.

Final Accounts: Trading, Profit and Loss accounts and Balance sheet (without adjustment)

### Section-B

Financial Management: Meaning, scope and role, a brief study of functional areas of financial management. Introduction to various FM tools: Ratio Analysis, Fund Flow statement and cash flow statement (without adjustments)

### Section-C

Costing: Nature, importance and basic principles, Marginal costing: Nature scope and importance, Break even analysis, its uses and limitations, construction of break even chart, Standard costing: Nature, scope and variances, Budgetary Control (only introduction)

### Section-D

Computerized Accounting: Advantages, Computer Programs for accounting, Computer based Auditing.

### **Suggested Readings/Books:**

1. Principles: A Book- Keeping by J.C. Katyal
  2. Principles of Accounting by Jain and Narang,.
  3. Financial Management by I.M. Pandey, Vikas Publications.
  4. Management Accounting, by Sharma, Gupta & Bhall.
  5. Cost Accounting by Jain and Narang
  6. Cost Accounting by Katyal.
  7. Basic Accounting, Second Edition by Rajni Sofat, Preeti Hiro, PHI.
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## MCA-105 Technical Communication

### Unit-I

Basics of Technical Communication- Functions of Communication-Internal &External Functions, Models-Shannon &Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7C's and other principles), Non-verbal Communication.

### Unit-II

Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), Precise writing, reading and comprehension, Letters- Format &various types.

### Unit-III

Advanced Technical Writing: Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography.

### Unit-IV

Verbal Communication- Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences.

### Unit-V

Technical Communication-MS-Word, Adobe Frame maker and ROBO Help \* Lab Exercises based on Listening and Speaking skills

### **Suggested Readings/Books:**

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi
2. K K Ramchandran, et al Business Communication, Macmillan, New Delhi
3. Swati Samantaray, Business Commnication and Commnicative English, Sultan Chand, New Delhi.
4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD)



## **MCA-106 Software Lab-I (Information Management)**

This laboratory course will mainly comprise of exercises on Section D of the Course MCA-101 [Information Management]

## **MCA-107 Software Lab-II (Object Oriented Programming in C++)**

This laboratory course will mainly comprise of exercises on what is learnt under paper: MCA 102 [Object Oriented Programming in C++]

Note: Program should be fully documented with simple I/O data. Flowcharts should be developed Wherever necessary.

- Write program in 'C++' language
- Using input and output statements
- Using control statements.
- Using functions.
- Using array
- Using Classes and implementation of Constructor and Destructor. Using files.
- Using OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions)

# Second Semester

## MCA-201 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

### Section A

A general introduction, simple and multigraphs, directed and undirected graphs, Eulerian and Hamiltonian Graphs, Shortest path algorithms, Chromatic number, Bipartite graph, graph coloring.

Section B  
Sets and Relations: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, min set, Partitions of sets, Relations: Basic definitions, graphs of relations, properties of relations

### Section C

Algebra of logic, Propositions, Connectives, Tautologies and contradiction, Equivalence and implication, Principle of Mathematical induction, quantifiers.

### Section D

Introduction of a Matrix, its different kinds, matrix addition and scalar multiplication, Multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix, solving simultaneous equations using Gauss elimination, Gauss Jordan Methods, Matrix Inversion method.

### References:

1. Alan Doerr, "Applied Discrete Structures for Computer Science", Galgotia Publications.
2. Kolman and Busby "Discrete Mathematical structures for Computer Sciences" PHI

## **MCA202: Relational Database Management Systems**

### Section–A

#### Review of DBMS:

Basic DBMS terminology; Architecture of a DBMS: Data Independence-Physical and Logical

Independence, Degree of Data Abstraction, Initial Study of the Database, Database Design,

Implementation and Loading, Testing and Evaluation, Operation, Maintenance and Evaluation.

#### Conceptual Model:

Entity Relationship Model, Importance of ERD, Symbols (Entity:Types of Entities, weak Entity, Composite Entity, Strong Entity, Attribute: Types of Attribute, Relationship: Type of relationship, Connectivity, Cardinality).

### Section–B

#### Database Models and Normalization:

Comparison of Network, Hierarchical and Relational Models, Object Oriented Database, Object

Relational Database, Comparison of OOD & ORD; Normalization and its various forms, De-Normalization, Functional Dependencies, Multi-valued Dependencies, Database Integrity:

Domain, Entity, Referential Integrity Constraints.

#### Transaction Management and Concurrency Control:

Client/ Server Architecture and implementation issues, Transaction: Properties, Transaction Management with SQL, Concurrency; Concurrency Control: Locking Methods: (Lock Granularity, Lock Types, Two Phase Locking, Deadlocks), Time Stamping Method, Optimistic Method, Database Recovery Management.

### Section–C

#### Distributed Databases:

Centralized Verses Decentralized Design; Distributed Database Management Systems (DDBMS): Advantage and Disadvantages; Characteristics, Distributed Database Structure, Components, Distributed Database Design, Homogeneous and Heterogeneous DBMS.

#### Levels of Data and Process Distribution:

SPSD (Single–Site Processing, Single- Site Data), MPSD (Multiple-Site Processing, Single Site

Data), MPMD (Multiple–Site Processing, Multiple-Site Data), Distributed Database Transaction

Features, Transaction Transparency, Client/Server Vs DDBMS.

Section–D

Business Intelligence and Decision Support System: The need for Data Analysis, Business Intelligence, Operational Data vs. Decision Support Data, DSS Database properties and importance, DSS Database Requirements.

OLAP and Database Administration:

Introduction to Online Analytical Processing (OLAP), OLAP Architecture Relational, Star Schemas, Database Security, Database administration tools, Developing a Data Administration Strategy.

**References:**

1. "Database Systems", Peter Rob Carlos Coronel, Cengage Learning, 8thed.
1. "Database System Concepts", Henry F. korth, Abraham, McGraw-Hill, 4thed.
2. "An Introduction To Database Systems", C.J. Date, Pearson Education, 8thed.
3. "Principles of Database Systems", Ullman, Galgotia Publication, 3rded.
4. "An Introduction To Database Systems", Bipin C. Desai, Galgotia Publication



## MCA-203 DATA STRUCTURES

### Section A

- Introduction to Data Structure: Concept of data, problem analysis, data structures and data structure operations, notations, mathematical notation and functions, algorithmic complexity, Big-O Notation and time space trade off.
- Overview of Arrays, Recursion, Pointers, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers, Static and Dynamic Memory Management, Garbage Collection.
- Understanding and Implementation of various Data Structures with applications
- Stack: operations like push, pop and various applications like conversion from infix to postfix and prefix expressions, evaluation of postfix expression using stacks
- Queues: operations like enqueue dequeue on simple, circular and priority queues.
- Linked Lists: operations like creations, insertion, deletion, retrieval and traversal on single, circular and doubly linked list.

### Section B

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- Trees definitions and concepts: Root, Node, Leaf Node, Level, Degree, Height and
- Tree representation using Linked List and Array
- Types of Trees: Binary trees, Binary search tree, Height balanced (AVL) tree, B-trees, B+ Tree
- Tree operations: creation, insertion, deletion and traversals (Preorder, In-order, Post-ordered) and searching on various types of trees.
- Heap: Definition, Structure, Algorithms and applications

### Section C

- Graph definitions and concepts: Edge, Vertices, and Graph representation using Adjacency matrix, Adjacency lists
- Types of graphs: Weighted, Unweighted, Directed, Undirected Graphs
- Graph operations: creation, insertion, deletion, traversals and searching (depth-first, breadth-first) of various types of graphs and Dijkstra's algorithm for shortest distance calculation.

### Section D

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- Searching: Concept and efficiency of linear and binary search algorithms.
- Sorting: Concepts, Order, Stability, Efficiency of various algorithms (Selection
- Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort)
- Hashing: Definition, Implementation and applications

Note:

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Programs are to be implemented in C++

**Books:**

1. Data Structures– A Pseudo code Approach with C++ -Gilberg and Forouzan by Cengage  
□
2. Schaum’s Outline of Data Structures with C++- Hubbard John. R by Tata McGraw-Hill  
□
3. Data Structures Using C and C++-Langsam, Augenstein, Tanenbaum by Pearson Education

## **MCA-204 DATA COMMUNICATION AND NETWORKS**

Objectives: As part of this course, students will be introduced to Computer Networks and Data Communication paradigms, about Network models and standards, Network protocols and Their use, wireless technologies.

### **SECTION-A**

Introduction to Data Communication: Components of Data Communication, Data Representation, Transmission Impairments, Switching, Modulation, Multiplexing.

Review of Network Hardware: LAN, MAN, WAN, Wireless networks, Internet works.

Review of Network Software: Layer, Protocols, Interfaces and services.

Review of Reference Models: OSI, TCP/IP and their comparison

Physical Layer

Transmission Media: Twisted pair, Coaxial Microwave, Infrared). Introduction Communication Satellites. Cable, Fiber optics, Wireless transmission (Radio, to ATM, ISDN, Cellular Radio and

### **SECTION-B**

Data Link Layer

Services provided by DLL: FRAMING, ERROR CONTROL, FLOW CONTROL, MEDIUM ACCESS

Medium Access Sublayer

Channel Allocation, MAC protocols–ALOHA, CSMA protocols, Collision free protocols,

Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards And their comparison.

### **SECTION-C**

Network Layer

Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding), Internetworking, IP Protocol, ARP,RARP.

Network Trouble Shooting

Using Ping, Trace route, IP config, Netstat, ns look

## SECTION-D

### Transport Layer

Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP).

### Application Layer

Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

### **Suggested Books:-**

1. Tanenbaum, Andrew S., 2009: Computer Networks (4th Edition), PHI.
2. Forouzan, B. A., 2009: Data Communications and Networking, Fourth Edition, Tata McGraw Hill.
3. Douglas E. Comer, 2004: Internetworking with TCP/IP (Vol.1, 4th Edition), CPE.
4. Stallings, William 2008: Data and Computer Communications (8th Edition), PHI.
5. Nance, Bary, 1997: Introduction to Networking, PHI, 4th Edition.

## MCA-205 LINUX OPERATING SYSTEM

### SECTION-A

#### INTRODUCTION TO LINUX OPERATING SYSTEM:

Introduction and Types of Operating Systems, Linux Operating System, Features, Architecture Of Linux OS and Shell Interface, Linux System Calls, Linux Shared Memory Management, Device and Disk Management in Linux, Swap space and its management. File System and Directory Structure in Linux. Multi- Processing, Load sharing and Multi-Threading In Linux, Types of Users in Linux, Capabilities of Super Users and equivalents.

INSTALLING LINUX AS A SERVER : Linux and Linux Distributions ;Major differences between various Operating Systems (on the Basis of: Single Users vs Multiusers vs Network Users; Separation of the GUI and the Kernel; Domains; Active Directory;).

INSTALLING LINUX IN A SERVER CONFIGUARTION: Before Installation; Hardware; Server Design; Dual-Booting Issues; Modes of Installation; Installing Fedora Linux; Creating a Boot Disk; Starting the Installation; GNOME AND KDE : The History of X Windows; The Downside; Enter GNOME; About GNOME; Starting X Windows and GNOME; GNOME Basics; The GNOME Configuration Tool.

### SECTION-B

INSTALLING SOFTWARE: The Fedora Package Manager; Installing a New Package using dpkg and RPM; Querying a Package; Uninstalling a Package using dpkg and RPM; Compiling Software; Getting and Unpacking the Package; Looking for Documentation; Configuring the Package; Compiling Your Package; Installing the Package, Driver Support for various devices in linux.

MANAGING USERS: Home Directories ;Passwords; Shells; Stratup Scripts; Mail; User Databases; The / etc/ passwd File; The / etc/ shadow File; The / etc/group File; User Management Tools; Command-Line User Management; User Linux Conf to Manipulate Users and Groups; SetUID and SetGID Programs.

## SECTION-C

THE COMMAND LINE : An Introduction to BASH, KORN, C, A Shell etc. ; BASH commands: Job Control; Environment Variables; Pipes; Redirection; Command-Line Shortcuts; Documentation Tools; The man Command; the text info System; File Listings; Owner ships and permissions; Listing Files; File and Directory Types; Change Ownership; Change Group; Change

Mode ; File Management and Manipulation; Process Manipulation; Miscellaneous Tools; Various Editors Available like: Vianditsmodes, Pico, Joeandemacs, Su Command.

## SECTION-D

BOOTING AND SHUTTING DOWN: LILO and GRUB; Configuring LILO; Additional LILO options; Adding a New Kernel to Boot; Running LILO; The Steps of Booting; Enabling and disabling Services

FILE SYSTEMS: The Makeup File Systems; Managing File Systems; Adding and Partitioning a Disk; Network File Systems; Quota Management;

CORE SYSTEM SERVICES: The init Service; The inetd and xinetd Processes; The syslogd Daemon; The cron Program

PRINTING: The Basic of lpd; Installing LPRng; Configuring /etc/printcap; The /ETC/lpd. perms File; Clients of lpd, Interfacing Printer through Operating System.

### **References:**

1. [Linux Administration: A Beginner's Guide](#) by Steve Shah, Wale Soyinka, ISBN 0072262591(0-07-226259-1),McGraw-Hill Education
2. Unix Shell Programming, Yashavant P.Kanetkar
3. UNIX Concepts and Applications by Sumitabha Das
4. Operating System Concepts8thedition, by Galvin

## **MCA206: Software Lab–III (Relational Database Management System)**

### Learning Objectives:

1. Comparative study of various Database Management Systems
2. Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language(DCL)
3. How to apply Constraints at various levels.
4. View data in the required form using Operators, Functions and Joins.
5. Creating different types of Views for tailored presentation of data
6. How to apply Conditional Controls in PL/SQL
7. Error Handling using Internal Exceptions and External Exceptions
8. Using various types of Cursors
9. How to run Stored Procedures and Functions
10. Creating Packages and applying Triggers
11. .Creating Arrays and Nested Tables.

## MCA-207 Software Lab–IV (DataStructures)

List of practical exercises, to be implemented using object-oriented approach in C++ Language.

1. [ARRAY] Write a menu driven program to Insert an ew element at end as well as at a given position, Delete an element from a given position, To find the location of a given element using linear search, To display the elements of the linear array.
2. [LINKEDLIST] Write a menu driven program to Insert an ew element, Delete an existing element, Display all the elements.
3. 3.Write a program to implement PUSH & POP operation on stack.
4. 4.Program to implement INSERT & DELETE operation on circular queue represented using a Linear array.
5. 5.Program to sort an array of integers in ascending order using bubblesort.
6. Program to sort an array of integers in ascending order using selection sort.
7. Program to sort an array of integers in ascending order using insertion sort.
8. Program to sort an array of integers in ascending order using merge sort.
9. Program to sort an array of integers in ascending order using quick sort.
10. Program to demonstrate the use of binary search algorithm to search a given element in a sorted array in ascending order.
11. Program to insert, delete and display operations on a binary search tree.
12. Program to illustrate the traversal of graph using breadth-first search.
13. Program to illustrate the traversal of graph using depth-first search.



## **MCA-208 Software Lab-V (LINUX OPERATING SYSTEM)**

### Learning Objectives:

1. How to install different distributions of Linux (Fedora, red Hat, Open Suse etc.).
2. Booting and Shutting down the system.
3. Learning the use of VI Editor for Shell programming, Searching & Sorting Processes.
4. User Management
5. Package management.
6. File/Directory Management.
7. Installing Printer and using Printer services.
8. Process Management.
9. Security and Protection of system.
10. Privilege management.
11. Managing various services (Cron & Quotaetc) in Linux.
12. Running a project to learn over all Linux System Usage.

### References:

1. Linux Administration: A Beginner's Guide by Steve Shah, Wale Soyinka, ISBN 0072262591(0-07-226259-1), McGraw-Hill Education
2. [Unix Shell Programming, Yashavant P. Kanetkar](#)
3. UNIX Concepts and Applications by Sumitabha Das

# Third Semester

## MCA301 Database Administration

### Section-A

#### (Introduction)

Understanding role and responsibilities of DBA, Database Environment management (network, CPU, disk and RAM), Installing and upgrading various database packages (MS SQL Server, Oracle, MySQL), Comparing various database packages, Configuring various services and components, Understanding the client/server model, Communication protocols, Database instance management, Creating and managing various database objects (tables, views, indexes)

### Section-B (Managing Database Servers)

Understating client tools for administrative tasks, Task Automation, Implementing migration, consolidation, and upgrade strategy, Hardware resource allocation, Business policy implementation, Monitoring and trouble-shooting, Implementing database compression, Database Replication and multiple servers, Exporting and Importing data, Managing Data integrity

### Section-C (Security and Availability)

Understanding User Access and Security, Creating and modifying user accounts, Creating, Modifying and Using roles, Granting and Revoking Privileges, Querying role information, Auditing User activity, Implementing database encryption, Database backup, restoration and recovery, Types of failure, Defining a backup and recovery strategy, Testing the backup and recovery plan, RAID implementation, High-availability and disaster recovery

### Section-D (Performance Tuning)

Introduction to performance tuning and its requirement, performance tuning methodology and concepts, Monitoring status variables that affect performance, General Table Optimizations, Using indexes to improve performance, Monitoring and optimizing the performance of the database, Identifying full-tables cans, Re-writing SQL queries, Tuning sub-queries, Database mirroring, clustering

Note: Subject Coverage will be preferably based on MySQL.

### **Reference Books:**

1. Microsoft Sql Server 2012 Bible by Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla, Aaron Nelson (Wiley India Pvt Ltd)
2. Pro SQL Server 2012 Administration, 2nd Ed by Ken Simmons, Sylvester Carstarphen (Dream tech Press)
3. Expert Oracle Database 11G Administration by Sam R. Alapati (Dream tech Press) MySQL Administrator's Bible By Sheeri K Cabral, Keith Murphy (John Wiley & Sons)

## MCA302 Information Security

### Section-A

Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy

Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudo random Numbers, Practical Application: Encryption of Stored Data

### Section-B

User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System

Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control Example: UNIX File Access Control, Role-Based Access Control

Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security

### Section-C

Malicious Software: Types of Malicious Software (Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAME-mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload–Information theft–Key loggers, Phishing, Spyware, Payload–Steal thing–Backdoors, Rootkits

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack

Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks

Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output

## Section-D

Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security

Trusted Computing and Multilevel Security: The Bell-La Padula Model for Computer Security, Other Formal Models for Computer Security, The Concept of Trusted Systems, Application of Multilevel Security, Trusted Computing and the Trusted Platform Module, Common Criteria for Information Technology Security Evaluation, Assurance and Evaluation

IT Security Management and Risk Assessment: IT Security Management, Organizational Context and Security Policy, Security Risk Assessment, Detailed Security Risk Analysis

IT Security Controls, Plans, and Procedures: IT Security Management Implementation, Security Controls or Safe guards, IT Security Plan, Implementation of Controls, Implementation Follow-up.

### **Textbook:**

W. Stallings, "Computer Security: Principles and Practice," 2nd Edition, Prentice Hall, ISBN:0132775069, 2011.

### **Recommended Books:**

1. M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley, ISBN:0470626399,2011.
2. M.E.Whitmanand H.J.Mattord, "Principles of Information Security," 4th Edition, Course Technology, ISBN:1111138214,2011.
3. M.Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN:0-201-44099-7,2002.
4. G.McGraw, "Software Security: Building Security In," Addison Wesley, ISBN:0321356705,2006.

## MCA-303 Software Engineering & Project Management

### Section-A

Software Engineering: The software problem, Evolution of Software Engineering, Principles of Software engineering, Software Development vs. Software Engineering.

Software Process: Software Process, Selection of appropriate process model, Software Process Models- Waterfall, Spiral, Prototyping, Agile Methodology-Scrum and XP.

### Section-B

Advanced Requirement Analysis & Design: Analysis Principles, SRS, Requirement Elicitation Techniques- FAST and QFD, Design Principles, Design Concepts, Data Design, Architectural Design-

Architectural Styles, Procedural & Object Oriented Design.

### Section-C

Software Project Management: The Management Spectrum, Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks- PERT/CPM, COCOMO-I, COCOMO-II, Risk Assessment-Probability Matrix, Risk Management.

Software Testing: Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, Testing Techniques- White Box & Black Box, Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing.

### Section-D

Software Quality Management: S/W Quality, Importance of S/W Quality, Quality Metrics, Quality Standards-ISO9126, Change Control, Change Control Process.

Advanced S/W Engineering: CASE Tools, Reverse Engineering, Re-engineering, Web Engineering.

### **References:**

1. Thayer, Software Engineering Project Management 2nd ed, Wiley
2. R.S. Pressman, Software Engineering: A Practitioner's Approach (6th ed.), McGraw-Hill, 2006
3. Peters, Software Engineering: An Engineering Approach, Wiley
4. Sommerville, Ian, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.
5. K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd ed.), New Age International Publishers, 2006.

## MCA-304 JAVA PROGRAMMING

Objective of the course:

The objective of this course is to get insight of the subject and after completion of this course, students will be able to:

Use the advanced features of Java Technology. Develop good program to handle exceptions and errors in program. Work with collection API and develop fast programs. Use the java.io package in detail. Use the serialization concepts of java technology. Develop good multithreaded programs Work the latest JDBC technology Learn Java Generics and the development of Projects.

### Section A

Introduction: Object Oriented Concept overview, features and applications of Java, Differences between Java and C++, structure of Java Program, understanding class path. Building Blocks: Literals, Tokens, Keywords, constants, variables & Data types, scope of variables, Operators, Expressions, Flow Control statements.

Arrays, Vectors, Type Conversion, Command Line Arguments, Review of classes and methods, Access specifiers, constructors, Inheritance, static Classes, Abstract Classes, Final Classes, Wrapper Classes: Autoboxing and Unboxing, Garbage Collection & Finalize method,

Enumerated types and annotations, Handling String and String Buffer classes, Method Overloading and Overriding, Nesting of methods and methods with var args.

### Section B

Interfaces & Packages: Interfaces and implementing multiple inheritance through interfaces, Packages, Multithreaded Programming, Synchronization.

Exception Handling: Introduction, Handling System defined Exceptions, Creating and handling user defined exception.

Managing I/O: Introduction to streams, Handling and using various Stream Classes, Random, String Tokenizer, Scanner classes.

### Section C

Applet and Graphic Programming: Introduction to applets, Types of applets, Using Applet Applications, Passing Parameters to applets,

Introduction to Graphic Programming: Applying 2-D transformations on Objects, Event Handling, Layouts, Frames, Panels, Menu's, Popup Menus, Swings, JDBC.

### Section D

Advanced Programming: Servlet Programming( Servlet Life Cycle, Generic Servlet, Http Servlet, Http Servlet Request, Http Servlet Response, service method, do GET method, do POST method, Servlet Exception), Introduction to JSP, Syntax, Semantics, Declaration and Expressions

Socket Programming: Overview, Difference between TCP and UDP Sockets, Various methods associated with TCP and UDP.

**REFERENCES: -**

1. Introduction to Java Programming, Comprehensive Version, Y. Daniel Liang, Pearson, 9/E
2. Java 2 The Complete Reference by Petric Noughton And Herbet Schildt, McGraw Hill Professional, 1999
3. Head First java by Kethy Seirra and Bert Bates, Oxford Publications.
4. Head First Sevlets and JSP, 2nd Edition by Bryan Basham, Kathy Sierra, Bert Bates, O'Rielly Media.



## MCA-305A Elective System Programming

### Section-A

Assemblers and Macro Processors: Language processors, data structures for language processing, General Design Procedure, Single pass and two pass assembler and their algorithms, assembly Language specifications (example MASM). Macro Instructions, Features Of Macro Facility: Macro Instruction arguments, Conditional macro expansion, Macro call switch in macro.

### Section-B

Loaders and Linkers & Editors: Loader Schemes: Compile and go loader, general loaders scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Relocation, Design of Absolute Loader, Bootstrap Loaders, Dynamic Linking, MS-DOS Linker, Text Editors, Line Editor, Steam Editors, Screen editor, Word processors, Structure editors.

### Section-C

Compiler Design: Introduction to various translators, interpreters, debuggers, various phases of compiler, Introduction to Grammars and finite automata, Bootstrapping for compilers, Lexical Analysis and Syntax analysis, Intermediate Code Generation, Code optimization techniques, Code generation, Introduction to YACC, Just-in-time compilers, Platform Independent systems.

### Section-D

Operating System: Operating Systems and its functions, Types of operating systems: Real-time OS, Distributed OS, Mobile OS, Network OS, Booting techniques and subroutines, I/O programming, Introduction to Device Drivers, USB and Plug and Play systems, Systems Programming (API's).

### **TEXTBOOKS:**

Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.

Leland L. Beck, System Software, San Diego State University, Pearson Education, 1997.

Dhamdhare, D.M., System Programming and Operating Systems, Tata Mc-Graw Hill 1996.

### **REFERENCES:**

1. Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/Narosa 1985.

## MCA305B Theory of Computation

### Elective

#### Section-A

1. Introduction, Sets, Logic, Functions, Relations, Languages, Proofs Mathematical Induction, Strong Principle of Mathematical Induction, Recursive Definitions, Structural Induction

2. Regular Languages & Regular Expressions, Finite Automata (FA), Distinguishing Strings w.r.t. Language, Union, Intersection, & Complement of Languages

#### Section-B

3. Non-deterministic Finite Automata (NFA), NFA with Null-Transitions, Kleene's Theorem

4. A Criterion for Regularity, Minimal Finite Automata, Pumping Lemma for Regular Languages

5. Introduction to Context Free Grammar (CFG), Regular Grammars, Derivation (Parse) Trees & Ambiguities, An Unambiguous CFG for Algebraic Expressions, Simplified Forms & Chomsky Normal Forms

#### Section-C

6. Introduction to Push Down Automata (PDA), Deterministic PDA (DPDA), PDA corresponding to a Given CFG, CFG Corresponding to a Given PDA, Parsing

7. The Pumping Lemma for CFG, Intersection & Complement of CFGs, Decision Problems Involving CFGs

#### Section-D

8. Turing Machine (TM) Definition & Examples, Computing a Partial Function with a TM

9. Recursive Enumerable & Recursive Languages, Enumerating a Language, Context-Sensitive Languages & Chomsky Hierarchy

#### **Reference Book:**

"Introduction to Languages and the Theory of Computation", John C. Martin, Tata McGraw-Hill, (2003), 3rd Edition, ISBN:007049939X

#### **Suggested Additional Reading:**

1. "Elements of the Theory of Computation", Harry Lewis & Christos H. Papadimitriou, IEEE (PHI), 2nd Edition, ISBN-978-81-203-2233-2.

2. "Theory of Computation", Michael Sipser, Cengage Learning (2007), ISBN-13:978-81-315-0513-7

3. "Introduction to Automata Theory, Languages, and Computation", Hopcroft, Motwani & Ullman, Pearson Education, 3rd Edition, (2008), ISBN:978-81-317-2047-9

## **MCA305 C Elective**

### **EMBEDDED SYSTEMS**

#### Section A

Introduction to Embedded Systems: Overview of embedded systems, features, requirements and applications of embedded systems, recent trends in the embedded system design, common architectures for the ES design, embedded software design issues, introduction to development and testing tools.

#### Section B

Embedded System Architecture: Basics of 8-bit 40 Pin PIC microcontroller 16F877A, Memory Organization, Special Function Registers, GPIO, Timer Comparator and A/D Converter, Bus Architecture, Addressing Modes, Timers and Counters

#### Section C

Assembly language programming: Memory-Mapped I/O, Interrupt handling, PIC16F877A Instruction Set, Assembler Directives, Programming of PIC Microcontrollers

#### Section D

Applications of Embedded Systems: Industrial and control applications, networking and telecom applications, Digital Signal Processing and multimedia applications, Applications in the area of consumer appliances.

#### **References:**

1. "EmbeddedSystemsDesign"bySteveHeath
2. "Real-TimeSystems"byJaneWSLiu,PrenticeHall
3. "DesignwithPICMicrocontrollers"byJohnB.PeatmanPearsonEducation,1997  
PIC16F877ADataSheet

## **MCA-306(Software LabVI–DatabaseAdministration)**

Implementation of various DBA roles/techniques studied in MCA 301, like:

1. Practical implementation of various industry leading database packages.
2. Import/Export data between various databases and flat files.
3. Implementation Database replication Backup/Restore strategies
4. implementation User and Roles creation and management

## **MCA-307 S/W Lab-VII [JAVA Programming ]**

### Learning Objectives:

1. To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.
2. Multithreading.
3. Interfaces and Package handling.
4. Applet and Swings Programming.
5. Database Connectivity.
6. Java Servlets and Java Server Pages
7. Struts implementation.
8. Introduction to Hibernate.

Semester  
4th

## MCA401 Mobile Application Development

### Section-A

Characteristics of mobile applications. Architecture and working of Android, iOS and Windows phone 8 operating system. User-interface design for mobile applications and managing application data. Integrating cloud services, networking, OS and hardware into mobile-applications. Addressing enterprise requirements in mobile applications: performance, scalability, modifiability, availability and security.

### Section-B

Mobile Software Engineering(Design Principles, Development, Testing methodologies for mobile applications, Publishing, Deployment, maintenance, and management).

Introduction to Android Development Environment, What Is Android? Advantages and Future of Android, Frameworks, Tools and Android SDK. Installing Java, Android Studio, SDK Manager Components and updating its platforms, AVD Manager, Genymotion Plugin: Fastest Virtual devices, Understanding Java SE and the Dalvik Virtual Machine.

The Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML.

### Section-C

Application Development in Android: App Components (Intents and Intent Filters, activities, services, Content Providers, App Widgets, Processes and Threads), App resources, App Manifest and User interface, Action Bar, Content Sharing, Multi-Platform Designs, Animation and graphics, computation, Media and Camera, Location and sensors, Connectivity, Text and Input, Data Storage, Administration and Web Apps.

### Section-D

Introduction to iOS application development: Overview of iOS, iOS Development Environment, iOS Layers ,basic of Swift, Building an application for IOS.

Windows phone Environment: Overview of windows phone and its platform, Building windows phone applications.

### **References/ Text Books:**

1. Professional Mobile Application Development, JEFFMCWHERTER, SCOTTGOWELL, Wiley.
2. Android Studio Application Development, Belen Cruz, Zapata, Packt Publishing
3. Professional Android 4 Application Development, Reto Meier, Wrox Publication
4. Beginning iPhone Development with Swift, David Mark, A press Publication

### Web Resources

- Safari Textbooks Online: <http://library.ohio-state.edu/search/y?SEARCH=Safari>
- [Android Developer Site: http://developer.android.com/index.html](http://developer.android.com/index.html)
- [Stack Overflow: http://www.stackoverflow.com](http://www.stackoverflow.com)

## **MCA402E-Commerce and Web Application Development**

### Section–A

Introduction to Electronic Commerce, Potential benefits & limitations of E-Commerce, Traditional Commerce vs. E-Commerce vs. M-Commerce, Different E-Commerce Models (B2B, B2C, C2C, P2P), E-Commerce applications, Social Networks, Auctions & Portals, Legal and Ethical issues in E-Commerce. Introduction to Electronic Data Interchange, Types of EDI, Benefits of EDI, Overview of Electronic Payment system, Types of Electronic payment schemes (Credit cards, Debit cards, Smartcards, Internet banking), Issues in Electronic payment systems

### Section–B

Web Based Marketing and Communications: Online Advertising, E-Mail Marketing, Online Catalogs, Social Marketing and Targeted Marketing, Techniques and Strategies WWW concepts, Client/Server Computing, Web Servers and Clients, Web Browsers, Protocols and Ports, IP Address, Domains & DNS, URL, A Systematic approach to Website creation, Creating interactive and dynamic web pages, Factors in E-Commerce Website design, Web and Database integration, Website Optimization strategies E-Commerce security, threats, managing security issues through internet security protocols and standards, and Firewall.

### Section–C

HTML5: Introduction to HTML5, New features in HTML5, API, HTML 5 documents, HTML 5 tags: text formatting, text styles, Lists (ordered and unordered), adding graphics to HTML 5 page, creating tables, linking documents, images as hyperlinks, forms, frames. CSS3: Introduction, consistent web designing using CSS3, Introduction to Bootstrap-forms, grids, tables, Images

### Section–D

Java Script: Introduction: features, advantages, operators, data types, statements, control statements. writing java script into HTML5. documents, forms, functions, objects, clients side inter active webpage design, input validation, event handling, database connectivity. DOM: document, elements, attributes, event.

### **REFERENCES:-**

1. E-Commerce-Fundamentals and applications by chan, Wiley.
2. Web Technologies Black Book (HTML5.0, 9789351192510) by Kogent, Wiley.
3. E-Commerce Essentials by Kenneth Laudon and Carol Traver–Pearson Publication



4. Frontiers of Electronic Commerce by Ravi Kalakota, Andrew B. Whinston-Addison Wesley Publication
  5. E-Commerce, Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang- Wiley India Publication
  6. Web Enabled Commercial Application Development Using HTML, Java Script,
  7. DHTML and PHP by Ivan Bayross BPB Publication
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## MCA-403 Interactive Computer Graphics

### SECTION A

Review of Computer Graphics, Applications of computer graphics.

Introduction to Graphic devices like light pens, Graphic tablets, Graphic Cards, Data Glove, Digitizers, Graphs and types of Graphs.

Cathode-Ray tube, Raster Scan displays, Random Scan displays, Architecture of a Raster and Random Graphics System with display processor, Color generating techniques (shadow mask, beam penetration), Raster Scan Systems, Random Scan Systems, Graphics Monitors and Workstations, Color Models(RGB and CMY), color lookup Table.

### SECTION B

Input and Output primitives, Process and need of Scan Conversion, Scan conversion algorithms for line, circle and ellipse, effect of scan conversion, Bresenham's algorithms for Line and circle along With their derivations, midpoint circle algorithm with derivation, Area filling techniques, flood fill techniques, character generation techniques(like typography, vector and bitmap).

2-Dimensional Graphics: Cartesian and Homogeneous Co-ordinate System, Geometric transformations(translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Affine transformation, Two dimensional viewing transformation Windowing and clipping(line, and polygon and text). Concave and Convex Polygon, Cohen Sutherland line clipping and its algorithm, Sutherland Hodgem an polygon clipping.

### SECTION C

3-dimensional Graphics: Geometric transformations (translation, Scaling, Reflection, Rotation, Shearing), Composite transformations, Parallel and Perspective Projections. Bezier curves and its Properties, B-Spline curves. Fractals, Classification of fractals.

### SECTION D

Hidden line and surface elimination algorithms: Z-buffer, Painters algorithm, scan-line, subdivision, Shading and Reflection: Diffuse reflection, Specular reflection, refracted light, Half toning, Dithering techniques. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading(Mash Band effect). Morphing of objects

Note: Graphics Programming using C/C++ with introduction to Open GL.

**References:**

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI New Delhi; Third Edition.
  2. J. D. Foley, A. V. Dam, S. K. Feiner, J. F. Hughes, R. L. Phillips, "Computer Graphics Principles & Practices, Second Edition", Pearson Education, 2007.
  3. R. A. Plastock and G. Kalley, "Computer Graphics", McGraw Hill, 1986.
  4. F. S. Hill: Computer Graphics using OpenGL - Second Edition, Pearson Education - 2003.
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## MCA-404 ADVANCED OPERATING SYSTEM

### Section A

Multi-Processor and Distributed Operating System: Introduction, Architecture, Organization, Resource sharing, Load Balancing, Availability and Fault Tolerance, Design and Development Challenges, Inter-process Communication, Distributed Applications– Logical Clock, Mutual Exclusion, Distributed File System.

### Section B

Real Time and Embedded Operating Systems: Introduction, Hardware Elements, Structure- Interrupt Driven, Nano kernel, Microkernel and Monolithic kernel based models. Scheduling-

Periodic, Aperiodic and Sporadic Tasks, Introduction to Energy Aware CPU Scheduling

### Section C

Cluster and Grid Computing: Introduction to Cluster Computing and MOSIXOS, Introduction to the Grid, Grid Architecture, Computing Platforms: Operating Systems and Network Interfaces, Grid Monitoring and Scheduling, Performance Analysis, Case Studies

### Section D

Cloud Computing: Introduction to Cloud, Cloud Building Blocks, Cloud aslaaS, PaaS and SaaS, Hardware & Software Virtualization, Virtualization of OS–Hypervisor KVM, SAN & NAS back-end concepts.

Mobile Computing: Introduction, Design Principals, Structure, Platform and Features of Mobile Operating Systems (Android, IOS, Windows Mobile OS)

### References:

1. Sibsankar Haldar, Alex A. Arvind, "Operating Systems", Pearson Education Inc.
  2. Tanenbaum and Van Steen, "Distributed Systems: Principles and Paradigms", Pearson, 2007.
  3. M.L. Liu, "Distributed Computing: Principles and Applications", Addison-Wesley, Pearson
  4. Maozhen Li, Mark Baker, "The Grid-Core Technologies", John Wiley & Sons, 2005
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## **MCA 405 SOFTWARELAB-VIII (Web & Mobile Application Development )**

- 1.Installing Java, Eclipse, and Android: Android Studio and Geny motion
- 2.Developing 2 Android based applications
- 3.Creating ordered and un-ordered lists in HTML 5 .
- 4.Creating tables in HTML5
- 5.Using images as hyperlinks.
- 6.Creating forms and frames in HTML5.
- 7.Designing web page using CSS3.
- 8.Program using if control statement in Java Script.
- 9.Program using loop control statement in Java Script.
- 10.Webpage accepting input from user and handling database connectivity.
- 11.Webpage Demonstrating input validation and event handling.

**Software Lab IX (Interactive Computer Graphics)**

**MCA-406**

The various algorithms will be implemented using C/C++ or OpenGL

# Fifth Semester



## MCA-501

### Artificial Intelligence

#### Section-A

Introduction: Intelligence, Foundations of artificial intelligence(AI). History of AI; Turing Test, The underlying assumption, and AI techniques, Level of Model.

Problems, Problem Space and Search: defining the problem as a state space search, Production System, Problem Characteristics, Production System and its characteristics. Water Jug problem and its space search.

#### Section-B

Un-informed Search: Depth First search, Breadth First Search its advantages and disadvantages.

Informed Search Strategies: Heuristic functions Best first search, A\* algorithm, Depth first Search, Breadth first search, Best First Search, advantages and disadvantages of informed search techniques. Iterative deepening, Game playing- Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning.

#### Section-C

Knowledge Representation: Characteristics and knowledge representation Issues: representation and mapping. Reasoning: Propositional Logic, predicate logic(first order logic) FOPL, logical reasoning, forward chaining, backward chaining; representing simple facts in logic, representing instance and IS A relationships, resolution principle with examples. Clausal form Representation, Inference.

#### Section-D

Uncertainty: Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems.

Weak-slot and-filler structures: Frames, Strong slot and filler structures: Conceptual dependency, scripts.

Communication: Communication among agents, formal grammar, parsing, grammar. Natural Language processing and its problems, discourse and pragmatic processing.

#### **Suggested/Readings & Books**

1. Stuart Russell and Peter Norvig. Artificial Intelligence—A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B.Nair, Artificial Intelligence, McGraw Hill, 2008.
3. George F.Luger, Artificial Intelligence, Pearson Education, 2001.
4. Nils J.Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

## MCA-502 Design & Analysis of Algorithms

### Section-A

Data Structures: Quick revision of Data Structures- stacks, queues, trees, heaps, sets and graphs.  
Trees:

Binary Search trees, Optimal BS Trees, AVL Trees, RB Trees, Hashing

### Section-B

Algorithms: What is an algorithm? Analyzing algorithms, order arithmetic, Time and space complexity of an algorithm, comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs. Exponential running time. Principles of Algorithm Design.

### Section-C

Basic Algorithm Design Techniques: Divide-and-conquer, Greedy, Randomization, backtracking, and dynamic programming. Example problems and algorithms illustrating the use of these techniques.

Sorting and searching: Insertion and selection sort, Binary search in an ordered array. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting.

### Section-D

Graphs and NP-completeness: Graph traversal: breadth-first search(BFS) and depth-first search (DFS). Applications of BFS and DFS. Shortest paths in graphs: Dijkstra algorithm. Definition of class NP, P, NP-hard and NP-complete problems.

### **Suggested Readings/Books:**

- 1.Fundamentals of Computers Algorithms by Ellis Horowitz, S.Sahni, and S.Rajasekaran, University Press.
- 2.The Design and Analysis of Computer Algorithms by A.V.Aho, J.E.Hopcroft, and J.D.Ullman, Pearson Education India.
- 3.Algorithm Design by J.Kleinberg and E.Tardos, Pearson Education India .
- 4.Introduction to Algorithms by Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, PHI.

## **MCA-503 Web Technologies**

### SECTION- A

XML: Introduction to XML, XML Basics, XML Syntax and Editors, documents, Elements, Attributes.

Creating: XML documents, Document Type Definitions(DTD), XML Schemas(XSD), XML

Name spaces, XML Document Object Model, XSLT. Use of XSLT with XML.

### SECTION- B

Introduction to Ajax, Use of Ajax in Website. Introduction to jQuery, Overview, retrieving page content, manipulating page content, working with events.

### SECTION-C

PHP: Server-side web scripting, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors/ problems.

Advanced PHP and MySQL: PHP/MySQL Functions, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions, E-Mail

### SECTION- D

Introduction to Web Services, Use of Web Services, Types of Web Services, Introduction to Content Management System CMS(Types, Usages, Benefits).

### TEXTBOOKS:

1. Web Technologies: HTML, Java Script, PHP, Java, JSP, XML and AJAX black book (9789350045930), Wiley. Professional XML, Wrox Publications.
2. Web Services Essentials: Distributed Applications with XML-RPC, SOAP,
3. Web Services Essentials: Distributed Applications with XML-RPC, SOAP, UDDI & WSDL By Ethan Cerami, O'Reilly

## **MCA-504 Object Oriented Analysis and Design using UML**

### Section A

Object orientation and Development, OO Benefits, Abstraction, OO Modelling,

The Three Models: Class Modelling (Objects and Classes, Relationships, Generalization and Inheritance, Association, Aggregation, Constraints, Packages), State Modelling (Events, States, Transitions and Conditions, State and Behaviour, Concurrency) and Interaction Modeling (Use case models, Sequence and Activity)

### Section B

System and Process, SDLC, Creation of SRS document: Requirement Specification,

Documentation and SDLC Models. Domain and Application Analysis (Class, State and

Interaction Models),

System Design (Subsystems, Global Resources, Conditions, Priorities)

Using design patterns (Abstraction-Occurrence, General Hierarchy, Player-Role, Singleton, Observer, Delegation, Adapter and Proxy Patterns), Class Design (Use cases, algorithms, refactoring, design optimization, inheritance adjustment)

### Section C

UML Diagram: Use case diagram, Class diagram, Object diagrams, Aggregation activities on real objects (Aggregation, Generalization relations, Association and multiplicity), Activity diagram (Activity and state diagram), Interaction Diagram (Sequence diagram, Collaboration diagram, Component diagram.)

### Section D

OO Methodologies (Structured Analysis, Structured Design (SA/SD), Jackson Structured Development (JSD), Information Modeling Notations), OMT as SE Methodology, OO Impact, OO Style (Reusability, Extensibility, Robustness, Programming-in-the-large), User centric design and usability principles, Reverse Engineering, Difficulties and risks in use-case modeling and UI design, System testing and maintenance. Use of open source tools for UML Design such as Plant UML, Argo UML.

### **TEXTBOOKS:**

1. Frederick Eddy, James Rumbaugh, Michael Blaha, William Premerlani, William
2. Lorenzen: Object-Oriented Modeling and Design, Pearson Education.
3. James Rumbaugh, Michael R. Blaha: Object-Oriented Modeling and Design with UML, Pearson Education.
4. Timothy C. Lethbridge, Robert Laganier: Object Oriented Software Engineering, Practical Software Development using UML and Java, Tata McGraw-Hill edition.
5. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dream tech India Pvt.Ltd.

**REFERENCE BOOKS:**

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt.Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGraw Hill.
5. Applying UML and Patterns: An introduction to Object-Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

## **MCA-505 Software Lab XI (Web Technologies)**

The software lab will be based upon the course Web Technologies (MCA-503).

**MCA-506 Software Lab XII (Object Oriented Analysis & Design with  
UML)**

The software lab will be based on UML.

# Semester 6th



## MCA-601 Data Warehousing and Data Mining

### Section A

Review of Data Warehouse: Need for data warehouse, Big data, Data Pre-Processing, Three tier  
Its schemas, Introduction to Spatial Data warehouse, Architecture of  
architecture; MDDM and Spatial Systems,  
Spatial: Objects, data types, reference systems; Topological Relationships, Conceptual Models for  
Spatial Data, Implementation Models for Spatial Data, Spatial Levels, Hierarchies and  
Measures Spatial Fact Relationships.

### Section B

Introduction to temporal Data warehouse: General Concepts, Temporality Data Types, Synchronization and  
Relationships, Temporal Extension of the Multi Dimensional Model, Temporal Support for Levels, Temporal  
Hierarchies, Fact Relationships, Measures, Conceptual Models for Temporal Data Warehouses: Logical  
Representation and Temporal Granularity

### Section C

Introduction to Data Mining functionalities, Mining different kind of data, Pattern/Context based Data  
Mining, Bayesian Classification: Bayes theorem, Bayesian belief networks Naive Bayesian classification,  
Introduction to classification by Back propagation and its algorithm, Other classification methods: k-Nearest  
Neighbour, case based reasoning, Genetic algorithms, rough set approach, Fuzzy set approach

### Section D

Introduction to prediction: linear and multiple regression, Clustering:  
types of Data in cluster analysis: interval  
scaled variables, Binary variables, Nominal, ordinal, and Ratio-scaled variables; Major  
Clustering Methods: Partitioning Methods: K-Mean and K-Medoids, Hierarchical methods:  
Agglomerative, Density based methods: DBSCAN

### **References:**

1. Data Mining: Concepts and Techniques By J.Han and M.Kamber Publisher Morgan Kaufmann Publishers
2. Advanced Data warehouse Design(from conventional to spatial and temporal applications)by  
Elzbieta Malinowski and Esteban Zimányi Publisher Springer
3. Modern Data Warehousing, Mining and Visualization By George M Marakas, Publisher Pearson

## MCA 602–Cloud Computing

### Section-A

Overview of Cloud Computing: Introduction, Definition of cloud, Characteristics of cloud, Why use clouds, How clouds are changing, Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud, “Big Data”, IT as a service.

### Section-B

Cloud computing concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multi tenancy, Types of tenancy, Application programming interfaces(API), Billing and metering of services , Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.

Cloud service delivery: Cloud service, Cloud service model architectures, Infrastructure as a service

(IaaS) architecture, Infrastructure as a Service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost To install versus ,Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

### Section-C

Cloud deployment scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

Security in Cloud computing: Cloud security reference model, security integration, security risks, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, enhancing cloud security, identity management

### Section-D

Cloud Computing platforms: IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A Comparison of Cloud Computing Platforms, Common building Blocks.

Integration of cloud computing with mobile and adhoc network technologies

### Suggested Readings/Books

1. Raj Kumar Buyya, James Broberg, Andrezej M. Goscinski, Cloud Computing: Principles and paradigms, 2011, Wiley.
2. Michael Miller, Cloud Computing, 2008.
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies, 2009.
4. Anthony T. Velte, Toby J. Velte and Robert Elsen peter, Cloud Computing: A practical Approach, McGraw Hill, 2010.
5. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
6. Borko Furht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010.

## **MCA-603 Advanced Computer Architecture**

Course Objectives: To understand and analyze the functionality, connectivity and performance of various processors and memory types.

### Section-A

Fundamentals of Processors: Instruction set architecture; single cycle processors, hardwired and micro-coded FSM processors; pipelined processors, multi-core processors; resolving structural, data, control and name hazards; analyzing processor performance.

### Section-B

Fundamentals of Memories: Memory technology; direct-mapped, associative cache; write-through and write-back caches; single-cycle, FSM, pipe-lined cache; analyzing memory performance.

### Section-C

Advanced Processors: Superscalar execution, out-of-order execution, register renaming, memory disambiguation, dynamic instruction scheduling, branch prediction, speculative execution; multi-threaded, VLIW and SIMD processors.

### Section-D

Advanced Memories: Non-blocking cache memories; memory protection, translation and virtualization; memory synchronization, consistency and coherence.

### **Recommended Books:**

1. Computer Architecture: A Quantitative Approach, by J.L Hennessy and D.A Patterson.
2. Digital Design and Computer Architecture, by D.M Harris and S.L Harris.

## MCA-604 Software Testing & Quality Management

### Section-A

Software Testing Fundamentals- Terminology, error, fault and failures, objectives, principles, Purpose of testing, Debugging, Theoretical and practical limitations of testing, The problem of Infeasible paths, Testability, Relationship of Testing with other activities, Testing levels, Unit testing, Integration testing, System testing, Acceptance testing.

Testing Techniques and Strategies-Static and dynamic testing, Software technical reviews, techniques And their applicability, Functional testing and analysis, Structural Testing and analysis, Hybrid approaches, Transaction flow analysis, Stress analysis, Failure analysis, Concurrency analysis, Performance analysis.

### Section-B

Flow graphs and Path Testing: Path testing basics, Path predicates, Application of path testing.

Data Flow Testing: Basics of data flow testing, Data flow model, Data flow testing strategies, Applications.

Software Testing and Regular Expression: Path products, Path sums, Loops, Reduction procedure, Applications, Approximate number of paths, Theme an processing time of any routine, Regular expression and Flow-anomaly detection

### Section-C

Software Quality: Software Quality Metrics, Standards, Certification and assessment, Quality management standards, Quality standards with emphasis on ISO approach, Capability Maturity Models-CMM and CMMI, TQM Models, The SPICE project, ISO/IEC15504, Six Sigma Concept for Software Quality.

Quality Planning: Inputs, Tools and techniques, Outputs

### Section-D

Quality Assurance: Inputs, Quality management plan, Results of quality control measurements, Operational definitions, Quality planning tools and techniques, Quality audits, Quality improvements

Quality Control: Inputs, Tools and techniques: Inspection, Control charts, Pareto diagrams, Statistical sampling, Flowcharting, Trend analysis, Outputs: Quality improvements, Acceptance decisions, Rework, Completed checklist, Process adjustments.

### **Recommended Books:**

1. 1.Jeff Tian, Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Wiley.
2. Boris B.Bezier, Software Testing Techniques, Wiley Dream tech Publication(2004).
3. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc.(2006).
4. Glenford J.Myers, The Art of Software Testing, Wiley India Pvt.Ltd 2nd edition (2006).

### **MCA-605 Software Lab XIII(Software Testing & Quality Management)**

Developing applications to Automate basis path testing, Boundary value analysis, Dataflow testing, Branch And statement coverage, etc. Exposure to automated testing tools such as Rational test manager, Selenium, Load runner or any other similar tools.