

**IKG 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		
MCA 101	Information Management	4	1	-	40	60	100	5
MCA 102	Object Oriented Programming in C++	4	1	-	40	60	100	5
MCA 103	Computer Organization and Assembly Language	4	1	-	40	60	100	5
MCA 104	Accounting & Financial Management	4	1	-	40	60	100	5
MCA105	Technical Communication	3	1	2	40	60	100	5
MCA 106	Software Lab- I (Information Management)	-	-	4	60	40	100	2
MCA 107	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		
MCA 201	Mathematical Foundations of Computer Science	4	1	-	40	60	100	5
MCA 202	Relational Database Management System	4	1	-	40	60	100	5
MCA 203	Data Structures	4	1	-	40	60	100	5
MCA 204	Data Communication and Networks	4	1	-	40	60	100	5
MCA 205	Linux Operating System	4	1	-	40	60	100	5
MCA 206	Software Lab –III (Relational Database Management System)	-	-	4	60	40	100	2
MCA 207	Software Lab –IV (Data Structures)	-	-	4	60	40	100	2
MCA 208	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: 33 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 301	Database Administration	4	1	-	40	60	100	5
MCA 302	Design and analysis of algorithm	4	1	-	40	60	100	5
MCA 303	Software Engineering	4	1	-	40	60	100	5
MCA 304	Java Programming	4	1	-	40	60	100	5
MCA 305	Elective	4	1	-	40	60	100	5
MCA 306	Software Lab-VI [Database Administration]	-	-	4	60	40	100	2
MCA 307	Software Lab-VII [Java Programming]	-	-	4	60	40	100	2
Total		20	5	8	320	380	700	29

Fourth Semester**Contact Hours: 32 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 401	Mobile Application Development	4	1	-	40	60	100	5
MCA 402	E- Commerce & Web Application Development	4	1	-	40	60	100	5
MCA 403	Interactive Computer Graphics	4	1	-	40	60	100	5
MCA 404	Advanced Operating Systems	4	1	-	40	60	100	5
MCA 405	Software Lab- VIII (Web & Mobile Application Development)	-	-	6	60	40	100	3
MCA 406	Software Lab- IX (Interactive Computer Graphics)	-	-	4	60	40	100	2
MCA 407	Software Lab X (Advanced Operating Systems)	-	-	2	60	40	100	1
Total		16	4	12	340	360	700	26
* Students will undergo 6-8 weeks industrial training after 4th semester. Examination will be conducted along with 5th semester practical.								

Fifth Semester**Contact Hours: 32 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 501	Embedded Systems	4	1	-	40	60	100	5
MCA 502	Information Security	4	1	-	40	60	100	5
MCA 503	Web Technologies	4	1	-	40	60	100	5
MCA 504	Object Oriented Analysis & Design with UML	4	1	-	40	60	100	5
MCA 505	Hardware Lab – I (Embedded Systems)	-	-	4	60	40	100	2
MCA 506	Software Lab –XI (Web Technologies)	-	-	4	60	40	100	2
MCA 507	Software Lab –XII (Object Oriented Analysis and Design with UML)	-	-	4	60	40	100	2
MCA508	Industrial Training*	-	-	-	120	80	200	2
Total		16	4	12	460	440	900	28

Sixth Semester**Contact Hours: 34 Hrs**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 601	Data Warehousing & Mining	4	1	-	40	60	100	5
MCA 602	Cloud Computing	4	1	-	40	60	100	5
MCA 603	Advanced Computer Architecture	4	1	-	40	60	100	5
MCA 604	Software Testing & Quality Management	4	1	-	40	60	100	5
MCA 605	Software Lab- XIII(Software Testing)	-	-	2	60	40	100	1
MCA 606	Project	-	-	12	180	120	300	6
Total		16	4	14	400	400	800	27

List of Electives:

Course Code	(MCA 305) Elective	Course Code	(MCA 305) Elective
MCA 305 A	System Programming	MCA 305 C	Artificial Intelligence
MCA 305 B	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:

Introduction to Information Technology, Second Edition, Turban, Rainer, Potter, WSE, Wiley India.

Data Warehousing Fundamentals: A Comprehensive Study for IT Professionals, Paulraj Ponnian
BWSTN, Wiley India.

Information Assurance For The Enterprise: A Roadmap To Information Security- Corey Schou,
Daniel Shoemaker, Mc-Graw Hill Publications.

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:

Object Oriented Programming in Turbo C++, *Robert Lafore*, Galgotia Publications, 1994.

The C++ Programming Language, *Bjarne Wesley* Publications, 1994.

Object Oriented Programming with C++, *E.Balagurusamy*, Tata McGraw Hill

Object Oriented Software Engineering, *S.Halladay and M. Wiebel*, BPB Publications, 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

Multiprocessors: Characteristics of Multiprocessors, Interconnection structures-Time Shared Common Bus, Crossbar switch, Multistage Switching Network, Hypercube interconnection, Interprocessor 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:

- **Computer Organization-** *Car Hamacher, Zvonks Vranesic, Safwat Zaky*, V Edition, McGraw Hill. □
 - **Computer System Architecture,** *Mano, M.M.*, 1986: Prentice Hall of India. □
 - **Computer Architecture and Organization,** *John Paul Hayes:* McGraw-Hill International Edition □
 - **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:

- Principles: A Book-Keeping** by *J.C.Katyal*
 - Principles of Accounting** by *Jain and Narang*,.
 - Financial Management** by *I.M.Pandey*, Vikas Publications.
 - Management Accounting**, by *Sharma, Gupta & Bhall*,.
 - Cost Accounting** by *Jain and Narang*
 - Cost Accounting** by *Katyal*,.
 - 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 (7 C'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

- Vandana R Singh, The Written Word, Oxford University Press, New Delhi
- KK Ramchandran, et al Business Communication, Macmillan, New Delhi
- Swati Samantaray, Busines Commnication and Commnicative English, Sultan Chand, New Delhi.
- 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. Flow charts 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)
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Second Semester

MCA-201 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Section A

A general introduction, simple and multipgraphs, 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, minset, 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:

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

MCA 202: 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. “Data Base Systems”, Peter Rob Carlos Coronel, Cengage Learning, 8th ed.

2. "Database System Concepts", Henry F. korth, Abraham, McGraw-Hill, 4th ed.
3. "An Introduction To Database Systems", C.J.Date, Pearson Education, 8th ed.
4. "Principles of Database Systems", Ullman, Galgotia Publication, 3rd ed.
5. "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

- 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

- 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:

- Programs are to be implemented in C++

Books:

- Data Structures – A Pseudo code Approach with C++ - Gilberg and Forouzan by Cengage
- Schaum's Outline of Data Structures with C++ - Hubbard John. R by Tata McGraw-Hill
- 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, Internetworks.

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 cable, Fiber optics, Wireless transmission (Radio, Microwave, Infrared). Introduction to ATM, ISDN, Cellular Radio and Communication Satellites.

SECTION-B

Data Link Layer

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

Medium Access Sub layer

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, Traceroute, IPconfig, Netstat, nslookup

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(4thEdition),PHI.
2. Forouzan, B. A., 2009: Data Communications and Networking, Fourth Edition, Tata McGrawHill.
3. DouglasE.Comer,2004: Internetworking with TCP/IP (Vol.1,4thEdition),CPE.
4. Stallings,William 2008: Data and Computer Communications(8thEdition),PHI.
- 5.Nance,Bary,1997: Introduction to Networking,PHI,4thEdition.

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 LinuxConf 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: Vi and its modes, Pico, Joe and emacs, , 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 Concepts 8th edition, by Galvin

MCA 206: 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 (Data Structures)

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

1. [ARRAY] Write a menu driven program to Insert a new 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. [LINKED LIST] Write a menu driven program to Insert a new element, Delete an existing element, Display all the elements.
3. Write a program to implement PUSH & POP operation on stack.
4. Program to implement INSERT & DELETE operation on circular queue represented using a linear array.
5. Program to sort an array of integers in ascending order using bubble sort.
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 & Quota etc) in Linux.
12. Running a project to learn overall 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

MCA 301 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)

Understanding 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-table scans, Re-writing SQL queries, Tuning sub-queries, Database mirroring, clustering

Note: Subject Coverage will be preferably based on MySQL.

Reference Books

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

MCA302 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-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- ISO 9126, 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.

Section A

Introduction: Object Oriented Concept overview, Building Blocks: Literals, Tokens, Keywords, constants, variables & Data types, scope of variables, Operators, Expressions, Flow Control statements, Command Line Arguments, Review of classes and methods, Interfaces & Packages

Section B

Multithreaded Programming, Synchronization, Event Handling, Layouts, Frames, Panels, Menu's, Pop up Menus, Swings, JDBC, Introduction to web-HTML, CSS, Javascript

Section C

Advanced Programming: Servlet Programming(Servlet Life Cycle, Generic Servlet, HttpServlet, HttpServletRequest, HttpServletResponse, service method, doGet method, doPost method, Servlet Exception), Introduction to JSP, Syntax, Semantics, Declaration and Expressions

Section D

Introduction to struts Framework, What and Why, Model1 vs Model2 , Struts2 Features , Steps to create Struts2 application , Understanding Action class , Understanding struts.xml file, Introduction to Hibernate only.

REFERENCES: -

1. Introduction to Java Programming, Comprehensive Version, Y. Daniel Liang, Pearson, 9/E
2. Java 2 The Complete Reference by Petric Noughton And Herbert 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.
5. Struts: The Complete Reference, 2nd Edition
6. Beginning Hibernate: From Novice to Professional

MCA -305 A 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 calls within macro.

Section-B

Loaders and Linkers & Editors: Loader Schemes: Compile and go loader, general loader 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).

TEXT BOOKS:

- 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.

Theory of Computation
Elective
MCA 305 B

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, & Compliment 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

MCA 305 C Elective 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-306 (Software Lab VI – Database Administration)

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

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

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

Learning Objectives:

- To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.
- Multithreading.
- Interfaces and Package handling.
- Applet and Swings Programming.
- Database Connectivity.
- Java Servlets and Java Server Pages
- Struts implementation.
- 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, ActionBar, 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, JEFF MCWHERTER, SCOTT GOWELL, Wiley.
- 2 Android Studio Application Development, Belen Cruz, Zapata, Packt Publishing
- 2 Professional Android 4 Application Development, Reto Meier, Wrox Publication
- 3 Beginning iPhone Development with Swift, David Mark, Apress Publication

Web Resources

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

MCA 402 E-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, Smart cards, 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, HTML5 documents, HTML5 tags: text formatting, text styles, Lists (ordered and unordered), adding graphics to HTML5 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, client side interactive web page design, input validation, event handling, database connectivity. DOM: document, elements, attributes, event.

REFERENCES:-

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

- Frontiers of Electronic Commerce by Ravi Kalakota, Andrew B. Whinston - Addison Wesley Publication
 - E-Commerce, Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang - Wiley India Publication
 - Web Enabled Commercial Application Development Using HTML, JavaScript, 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 and windowing and clipping (line, polygon and text). Concave and Convex Polygon, Cohen Sutherland line clipping and its algorithm, Sutherland Hodgeman polygon clipping.

SECTION C

3-dimensional Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, 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, Halftoning, 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 Open GL- 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, Nanokernel, 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 MOSIX OS, 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 as IaaS, 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:

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

1. Installing Java, Eclipse, and Android: Android Studio and Genymotion
2. Developing 2 Android based applications
3. Creating ordered and un-ordered lists in HTML5.
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. Web page accepting input from user and handling database connectivity.
11. Web page Demonstrating input validation and event handling.

Software Lab IX (Interactive Computer Graphics)

MCA - 406

The various algorithms will be implemented using C/C++ or Open GL

Software Lab X (Advanced Operating Systems)

MCA - 407

The Software Lab will be based upon MOSIX OS

Fifth Semester

EMBEDDED SYSTEMS

MCA-501

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, PIC 16F877A 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. "Embedded Systems Design" by Steve Heath
2. "Real-Time Systems" by Jane W S Liu, Prentice Hall
3. "Design with PIC Microcontrollers" by John B. Peatman Pearson Education, 1997
4. PIC 16F877A Data Sheet

MCA-502 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 Pseudorandom 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–SPAM E-mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload–Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealth–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-LaPadula 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 Safeguards, 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

M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley, ISBN: 0470626399, 2011.

M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4th Edition, Course Technology, ISBN: 1111138214, 2011.

M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0-201-44099-7, 2002.

G. McGraw, "Software Security: Building Security In," Addison Wesley, ISBN: 0321356705, 2006.

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 Namespaces, 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).

TEXT BOOKS:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX black book (9789350045930), Wiley.
 2. Professional XML, Wrox Publications.
 3. 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 Modeling,

The Three Models: Class Modeling (Objects and Classes, Relationships, Generalization and Inheritance, Association, Aggregation, Constraints, Packages), State Modeling (Events, States, Transitions and Conditions, State and Behavior, 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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

MCA-505 Hardware Lab I (Embedded Systems)

The Hardware Lab will be based upon Section-C of the course Embedded Systems (MCA-501).

MCA – 506 Software Lab XI (Web Technologies)

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

MCA – 507 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 architecture; MDDM and its schemas, Introduction to Spatial Data warehouse, Architecture of 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 Neighbor, 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

MCA602 – Cloud Computing

Section-A

Overview of Cloud Computing : Introduction, Definition of cloud , 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, Multitenancy, 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, Platform as a service (PaaS) , 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 ad hoc network technologies.

Suggested Readings/Books

1. Raj Kumar Buyya, James Broberg, Andrezei 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 Elsenpeter, 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, Testing 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, The mean 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/IEC 15504, 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. *Jeff Tian, Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Wiley.*
2. *Boris B. Bezier, Software Testing Techniques, Wiley Dreamtech 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, Data flow testing, Branch and statement coverage, etc. Exposure to automated testing tools such as Rational test manager, Selenium, Loadrunner or any other similar tools.