

PUNJAB TECHNICAL UNIVERSITY KAPURTHALA

Scheme and Syllabus of Masters in Computer Applications (MCA)

Batch 2012 onwards

**By
Board of Studies Computer Applications**

Punjab Technical University

Scheme of MCA Batch 2012 Onwards

First Semester

Contact Hours: 33 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 101	Information Management	4	1	-	50	100	150	5
MCA 102	Object Oriented Programming in C++	4	1	-	50	100	150	5
MCA 103	Computer Organization and Assembly Language	4	1	-	50	100	150	5
MCA 104	Accounting & Financial Management	4	1	-	50	100	150	5
MCA105	Technical Communication	3	1	-	50	100	150	4
MCA 106	Software Lab- I (Information Management)	-	-	4	100	50	150	2
MCA 107	Software Lab –II (Object Oriented Programming in C++)	-	-	4	100	50	150	2
BTHU 102	Communicative English Lab	-	-	2	50		50	1
Total		19	5	10	500	600	1100	29

Second Semester

Contact Hours: 33 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	-	50	100	150	5
MCA 202	Relational Database Management System	4	1	-	50	100	150	5
MCA 203	Data Structures	4	1	-	50	100	150	5
MCA 204	Data Communication and Networks	4	1	-	50	100	150	5
MCA 205	Linux Operating System	4	1	-	50	100	150	5
MCA 206	Software Lab –III (Relational Database Management System)	-	-	4	100	50	150	2
MCA 207	Software Lab –IV (Data Structures)	-	-	4	100	50	150	2
MCA 208	Software Lab –V (Based on Linux Operating System)	-	-	4	100	50	150	2
Total		20	5	12	550	650	1200	31

Third Semester

Contact Hours: 32 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 301	Database Administration	4	1	-	50	100	150	5
MCA 302	Computer Based Optimization Techniques	4	1	-	50	100	150	5
MCA 303	Software Engineering	4	1	-	50	100	150	5
MCA 304	Java Programming	4	1	-	50	100	150	5
MCA 305	Elective	4	1	-	50	100	150	5
MCA 306	Software Lab-VI [Database Administration]	-	-	4	100	50	150	2
MCA 307	Software Lab-VII [Java Programming]	-	-	4	100	50	150	2
Total		20	5	8	450	600	1050	29

Punjab Technical University

Scheme of MCA Batch 2012 Onwards

Fourth Semester

Contact Hours: 32 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 401	Data Warehousing & Mining	4	1	-	50	100	150	5
MCA 402	E- Commerce & Web Application Development	4	1	-	50	100	150	5
MCA 403	Interactive Computer Graphics	4	1	-	50	100	150	5
MCA 404	Advanced Operating Systems	4	1	-	50	100	150	5
MCA 405	Software Lab- VIII (E- Commerce & Web Application Development)	-	-	4	100	50	150	2
MCA 406	Software Lab- IX (Interactive Computer Graphics)	-	-	4	100	50	150	2
MCA 407	Software Lab X (Advanced Operating Systems)	-	-	4	100	50	150	2
Total		16	4	12	500	550	1050	26

Fifth Semester

Contact Hours: 31 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA 501	Embedded Systems	4	1	-	50	100	150	5
MCA 502	Network Security & Administration	4	1	-	50	100	150	5
MCA 503	Web Technologies	4	1	-	50	100	150	5
MCA 504	Object Oriented Analysis & Design with UML	4	1	-	50	100	150	5
MCA 505	Hardware Lab – I (Embedded Systems)	-	-	4	100	50	150	2
MCA 506	Software Lab –XI (Web Technologies)	-	-	4	100	50	150	2
MCA 507	Software Lab –XII (Object Oriented Analysis and Design with UML)	-	-	4	100	50	150	2
Total		16	4	12	500	550	1050	26

Sixth Semester

Course Code	Course Title	Load Allocation	Marks Distribution		Total Marks	Credits
			Internal	External		
MCA 601	Industrial Training	Four Months	80	320	400	28

List of Electives:

Course Code	(MCA 305) Elective	Course Code	(MCA 305) Elective
MCA 305 A	System Programming	MCA 305 C	Parallel Processing
MCA 305 B	Theory of Computation		

MCA-101 Information Management

Unit –I

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.

Unit –II

IT Infrastructure in India – Telecommunication, Internet research and Broadband

Unit –III

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

Unit –IV

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

Unit –V

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.

Unit –VI

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.
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MCA-103 Computer Organization and Assembly Language

Objectives: The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. To introduce students to the design and organization of modern digital computers & basic 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

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, Business Communication and Communicative 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]

Note: The breakup of marks for the practical university examination will be as under

- Lab record 10 marks
 - Viva Voce 20 marks
 - Execution of commands 20 marks
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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)

The breakup of marks for the practical university examination will be as under

- Lab record 10 marks
 - Viva Voce 20 marks
 - Program Development and execution 20 marks.
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BTHU 102 Communication Skills Laboratory

Lab Exercises

Listening and Speaking

The audio CD accompanying S.P. Dhanavel's book shall be played in the lab to get the students familiar with the standard spoken English. The students must develop a high degree of understanding of spoken material as used in academic and professional environment. The teacher shall help them in the following:

- a) With the accent of the speaker if it is unfamiliar to them.
- b) The Standard English sounds and pronunciation of words.
- c) With the topical vocabulary and the idiomatic expressions which are generally part of colloquial speech.
- d) With the implied relationships in larger texts, if they are not stated explicitly.

In addition to the above, extended listening sessions shall be arranged to promote speaking activities among students. For this purpose, a set of twin books ***K. Sadanand and S. Punitha Spoken English Part I and II, A Foundation Course (with audio CD), Orient Blackswan***, is prescribed for use. The teachers shall play the CDs selectively in the lab and involve the students in the practice work based on them. While taking up lessons, the teacher must promote the use of dictionaries for correct pronunciation and give ample practice on word stress and weak forms.

The students are also supposed to supplement their listening practice by regularly viewing news/knowledge channels on the TV or lecture videos on the internet.

At the end of a session, a good speaker must:

- a) Be able to produce long turns without much hesitation in an accent that is understood all around.
- b) Have ready access to a large lexis and conventional expressions to speak fluently on a variety of topics.
- c) Have a knack for structured conversation or talk to make his transitions clear and natural to his listeners.

The teacher may use following different classroom techniques to give practice and monitor the progress of the students:

- Role play
- Question-answer
- Discussion
- Presentation of papers
- Seminars

Second Semester

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

Section A

A general introduction, simple and multipgrpahs, 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

Review of DBMS:

Section – A

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

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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

Internal Assessment: 100

External Assessment: 50

Note:

- ☐ Programs are to be implemented in C++

Suggested Operations:

- ☐ Creation of a data-structure
- ☐ Deletion of a data-structure
- ☐ Searching with a data-structure
- ☐ Sorting of a data-structure
- ☐ Inserting element in a data-structure
- ☐ Removing element from a data-structure
- ☐ Searing element in a data-structure
- ☐ Traversing through a data-structure

Suggested Applications:

- ☐ Reversing Data/Lists/Strings using stack
- ☐ Convert Decimal to Binary using stack
- ☐ Infix to Postfix Transformation using stack
- ☐ Quick sort using stack
- ☐ Round Ribbon algorithm implementation using queue
- ☐ Evaluation of Postfix Expression using stack
- ☐ Implementing selection algorithm using heap
- ☐ Implementing priority queues using heap
- ☐ Implementing sorting using heap
- ☐ Shortest path algorithm using graphs

MCA-204 DATA COMMUNICATION AND NETWORKS

Internal Assessment: 50 Marks
External Assessment: 100 Marks

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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. 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

INSTRUCTIONS FOR PAPER-SETTER

The Syllabus will consist of four sections. In University Question papers, there will be 5 sections. 4 Sections A, B, C & D will have two long questions of 20 marks each (from the respective sections of Syllabus) out of which the student has to attempt any one. Section E will comprise of 10 short answer type questions of 2 marks each covering the whole syllabus. Maximum weightage of External Question paper will be 100 marks. Internal weightage of theory subjects will be 50 marks.

INSTRUCTION FOR CANDIDATES

Candidates are required to attempt one question out of two from each section A, B, C and D and all questions from section E .

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 CONFIGURATION : 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; Startup 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)

Internal Assessment:100

External Assessment:50

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.

Learning Objectives:

1. Selecting suitable Data Structures for specific tasks.
2. Understanding various traversing techniques on various data structures.
3. Inserting and deleting elements in required data structures.
4. Searching data stored within various data structure using various search techniques.
5. Understanding memory-space trade off.
6. Sorting various data structures using different techniques.

Software Lab-V (LINUX OPERATING SYSTEM)

Internal Assessment: 100

External Assessment: 50

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

Internal Assessment:50

External Assessment: 100

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

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)

Computer Based Optimization Techniques

MCA 302

MCA-3rd Semester

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

SECTION-A

Introduction to Optimization Techniques, Origin & development of O.R., Nature & Characteristic features of O.R., Models & Modeling in Operation Research. Methodology of O.R. Linear Programming - Mathematical Model, Assumptions of Linear Programming, Graphical Method, Principles of Simplex method and its Applications, Duality, Dual simplex method- Primal Dual Relationship and sensitivity analysis.

SECTION-B

Special types of linear programming problems -Transportation and assignment problems, Unbalanced Assignment problems, Crew based assignment problems, Test for Optimality, Degeneracy in Transportation Problems, Unbalanced Transportation Problems.

SECTION-C

Definition of Probability, Sample Space, Algebra of Events, Addition and multiplication law of probability, Conditional Probability. Dynamic Programming-Features and applications of dynamic programming.

SECTION-D

Decision Theory, Integer Programming-Gomory Method and Branch & Bound Method.

Suggested Books:

1. Hiller, F.S. & Liberman, G.J., 1974: Introduction to Operations Research, 2nd Edn. Holden Day Inc. London.
2. Tara, H.A., 1982: Operations Research, 3rd Edn., McMillan Publishing Company.
3. Beightler, C.S. & Phillips, D.T., 1979: Foundations of Optimisation, 2nd. Edn. Prentice-Hall.
4. Rao, S. S., 1978: Introduction to Optimization: Theory & Applications, Wiley Eastern.
5. Srinath, L.S.: Linear Programming, East-West, New Delhi.

MCA-303 Software Engineering & Project Management

Internal Assessment:50

External Assessment: 100

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

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 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. R.S. Pressman, *Software Engineering: A Practitioner's Approach* (6th ed.), McGraw- Hill, 2006
2. P. Jalote, *An Integrated Approach to Software Engineering*(3rd ed.), Narosa Publishing House, 2005
3. K.K. Aggarwal and Y. Singh, *Software Engineering*(revised 2nd ed.), New Age International Publishers, 2006 .

4. *Sommerville, Ian, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.*
5. *Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw Hill Publishing Company Ltd., New Delhi (2006) 3rd ed.*

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.

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

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 varargs.

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, Pop up Menus, Swings, JDBC.

Section D

Advanced Programming: Servlet Programming(Servlet Life Cycle, Generic Servlet, HttpServlet, HttpServletRequest, HttpServletResponse, service method, doGet method, doPost method, ServletException), 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 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'Reilly Media.

MCA -305 A System Programming

Objectives: This course serves as an introduction to System programming. Here, we will focus on Assembler, Compiler, Macro Processors, Loaders, Linkers and other system software components.

Internal Assessment:50

External Assessment: 100

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

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

Objectives:

- Understanding and development of theoretical models of computations and their analysis.
- The models of computations include (i) Finite Automata (and Regular Languages), (ii) Push Down Automata (and Context-free Languages), (iii) Turing Machine (and their Languages).
- The aim of analysis is to identify and prove the capabilities and limitations of particular models of Computations.

Internal Assessment: 50

External Assessment: 100

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

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

PARALLEL PROCESSING

Elective MCA-305 C

Internal Assessment: 50
External Assessment: 100

Objectives: Objectives:

- To develop proficiency in parallel methodologies
- To study and understand the technologies enabling parallel computing
- To study different parallel programming models

Instructions for paper-setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 10 marks each. Section E will have 10-20 short answer type questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

SECTION-A

1. **Introduction** :Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science; Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.
2. **Parallel Processing Architectures: Parallelism** in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

SECTION-B

3. **Data Dependency Analysis: Introduction**, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.
4. **Shared Memory Programming: General** Model, Process Model under UNIX.

SECTION-C

5. **Thread Based Implementation: Thread** Management, Thread Implementation.
6. **Distributed Computing: Message** passing model, Parallel Virtual Machine (PVM), Remote procedure call.
7. **Algorithms for Parallel Machines: Speedup**, Complexity and Cost, Parallel Reduction.

SECTION-D

8. Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System.
9. **Parallel Programming Languages: Fortran 90**, nCUBE C, Occam, C-Linda.

Suggested Readings:

1. Sasikumar, M., Shikhara, Dinesh and Ravi Prakash, P.: Introduction to Parallel Processing, PHI.
2. Wilkinson, Barry: Parallel Programming Techniques & Applications & Michael Allen Using Networked Workstations and Parallel Computers, Pearson Education.
3. Crichlow, Joel M.: An Introduction to Distributed and Parallel Computing, PHI.

4. Rajaraman, V.: Elements of Parallel Computing, PHI.
5. Ragsdale, Susann: Parallel Programming, Intel McGraw Hill.

MCA-306 (Software Lab VI – Database Administration)

**Internal
Assessment:100
External Assessment:**

50

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]

Internal Marks: 100

External Marks: 50

Learning Objectives:

- To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.
- Dealing with Array and String Programming.
- Exception Handling.
- Multithreading.
- Interfaces and Package handling.
- File Handling.
- Applet and Swings Programming.
- Event Handling and Graphics Programming.
- Database Connectivity.
- Java Server Pages.
- Servlet and Socket(TCP & UDP) Programming.

Semester 4th

MCA-401 Data Warehousing and Data Mining

Internal Marks: 50

External Marks: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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

MCA 402 E-Commerce and Web Application Development

Internal Assessment: 50

External Assessment: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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.

Section–B

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

Web Based Marketing and Communications: Online Advertising, E-Mail Marketing, Online Catalogs, Social Marketing and Targeted Marketing, Techniques and Strategies

Section–C

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–D

Review of HTML, HTML tags; text formatting; text styles; lists: ordered, unordered and definition lists; layouts; adding graphics; tables; linking documents; images as hyperlinks; frames and layers; data collection using forms.

CSS: Introduction, consistent web designing using CSS

Java Script: Introduction, DOM, documents, forms, statements, functions, objects, client side interactive web page design, input validation, event handling

PHP: Introduction, server side dynamic programming, MYSQL database access

REFERENCES:-

- 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

Internal Assessment: 50

External Assessment: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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) , 3-D viewing devices, 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

Internal Assessment: 50

**External Assessment:
100**

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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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Learning Objectives:-

1. Creating Advanced HTML pages with the help of frames, scripting languages & evolving technologies & scripting like DHTML, JQuery, AJAX and XML.
2. Creating SQL Server database.
3. Creation of ODBC connectivity.
4. Development of Website which must contain the following features:
 - How businesses sell products & services on the web.
 - How to reach the Consumers on the web.
 - Online payment process.
 - Managing & Implementing security threats in E-Commerce application.
5. Implement backup and recovery plan of E-Commerce applications.
6. Understand the client/server infrastructure that supports E-Commerce
7. Development of Online Banking / Net Banking website which must provide following features
 - View bank account details, balance, download account statement etc.
 - Electronic Fund Transfer from one account to another within a single financial institution or across multiple financial institutions.
 - Request for cheque book, demand draft etc.
 - Manage Fixed deposits.
 - Online Payment of Utility bills & online shopping.

8. Understanding legal aspects and issues in E-Commerce applications.

Software Lab IX (Interactive Computer Graphics)

MCA - 406

Internal Assessment: 100

External Assessment: 50

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

Software Lab X (Advanced Operating Systems)

MCA - 407

Internal Assessment: 100

External Assessment: 50

The Software Lab will be based upon MOSIX OS

Fifth Semester

EMBEDDED SYSTEMS

MCA-501

Internal Marks: 50

External Marks: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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, communication software, 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 Convertor, Bus Architecture, data operations, 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 Network Security & Administration

Internal Marks: 50

External Marks: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

Section-A

Security Attacks –Passive & Active Attacks, Security Services, Security Mechanisms, Model for Internetwork Security, Man –In – the middle attack, Meet – in – the middle attack

Conventional Encryption Principles, Monoalphabetic ciphers, Playfair Ciphers, Transposition Ciphers, Cipher block chaining mode, approaches of message authentication.

Section-B

Public Key cryptography Principles, RSA algorithm, Digital Signatures , Digital Certificates, Certificate Authority and Key management Kerberos, X.509 Directory Authentication Service.

Section-C

IP Security : Security Problems of IP, Security Objectives, IP Security Protocol Modes, Authentication Header, Security Payload.

Firewall Characteristics, Types of Firewalls and their practical use, NAT

Section-D

Email Security: PGP, S/MIME

Web Security: Security Socket Layer, Transport Layer Security, Secure Electronic Transaction.

Text Books:

- Handbook of Applied Cryptography - Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone
 - Network Security and Cryptography – Bernard Menezes
 - Network Security Essentials – William Stallings
 - Data Communication and Networking-Behrouz A. Forouzan
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MCA-503 Web Technologies

Internal Assessment: 50

External Assessment: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

SECTION- A

Introduction to XML, XML Basics, XML Syntax and Editors, Elements, Attributes, 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

Introduction to Web Services, Use of Web Services, Types of Web Services, Introduction to SOAP, Syntax of SOAP, Envelope, Header and Body, Introduction to JSON, Syntax and Use,

SECTION- D

Introduction to Content Management System CMS (Types, Usages, Benefits), Introduction to Wordpress- Use, Building a simple website using Wordpress, Study of Wordpress dashboard, Customization of Wordpress website, Creation of Network Websites.

TEXT BOOKS:

1. 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
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MCA-504 Object Oriented Analysis and Design using UML

Internal Assessment: 50

External Assessment: 100

Instructions for Paper-Setter

The question paper will consist of five sections A, B, C, D and E. Section A, B, C and D will have two questions from the respective sections of the syllabus and will carry 20 marks each. Section E will have 10 short answer type conceptual questions, which will cover the entire syllabus uniformly and will carry 20 marks in all.

Instruction for Candidates

Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.

Use of non-programmable scientific calculator is allowed

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 Lorensen: 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.
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MCA-505 Hardware Lab I (Embedded Systems)

Internal Assessment: 100

External Assessment: 50

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

MCA – 506 Software Lab XI (Web Technologies)

Internal Assessment: 100

External Assessment: 50

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

MCA – 507 Software Lab XII (Object Oriented Analysis & Design with UML)

Internal Assessment: 100

External Assessment: 50

The software lab will be based on UML.

Semester 6th

MCA – 601 Industrial Training

Internal Assessment: 80

External Assessment: 320

This semester is based on Industrial training of duration of four months.
