Guru Nanak Dev Engineering College, Ludhiana

(An Autonomous College u/s 2(f) and 12(B) of UGC Act 1956)

(Affiliated to I.K. Gujral Punjab Technical University, Jalandhar)

Scheme and Syllabus
of
Master in Computer Applications
(MCA)

Batch 2015 Onwards

By
Board of Studies
Department of Computer Applications

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

First Semester **Contact Hours: 34 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15101	Information Management	4	1	-	40	60	100	5
MCA-15102	Object Oriented Programming in C++	4	1	-	40	60	100	5
MCA-15103	Computer Organization and Assembly Language	4	1	-	40	60	100	5
MCA-15104	Accounting & Financial Management	4	1	-	40	60	100	5
MCA-15105	Technical Communication*	3	1	2	40	60	100	5
MCA-15106	Software Lab-I(Information Management)	-	-	4	60	40	100	2
MCA-15107	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 the 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-15201	Mathematical Foundations of Computer Science	4	1	-	40	60	100	5
MCA-15202	Relational Database Management System	4	1	-	40	60	100	5
MCA-15203	Data Structures	4	1	-	40	60	100	5
MCA-15204	Data Communication and Networks	4	1	-	40	60	100	5
MCA-15205	Linux Operating System	4	1	-	40	60	100	5
MCA-15206	Software Lab-III(Relational Database Management System)	-	-	4	60	40	100	2
MCA-15207	Software Lab-IV(Data Structures)	-	-	4	60	40	100	2
MCA-15208	Software Lab-V(Based on Linux Operating System)	-	-	2	60	40	100	1
Total		**20**	**5**	**10**	**380**	**420**	**800**	**30**

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Scheme and syllabus of MCA

Batch 2015 Onwards

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

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15301	Database Administration	4	1	-	40	60	100	5
MCA-15302	Computer Based Optimization Techniques	4	1	-	40	60	100	5
MCA-15303	Software Engineering	4	1	-	40	60	100	5
MCA-15304	Java Programming	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-I	3	1	-	40	60	100	4
MCA-15305	Software Lab-VI(Database Administration)	-	-	4	60	40	100	2
MCA-15306	Software Lab-VII(Java Programming)	-	-	4	60	40	100	2
Total		**19**	**5**	**8**	**320**	**380**	**700**	**28**

Fourth Semester **Contact Hours: 31 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15401	Programming Languages	4	1	-	40	60	100	5
MCA-15402	E-Commerce & Web Application Development	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-II	3	1	-	40	60	100	4
MCA-15403	Advanced Operating Systems	4	1	-	40	60	100	5
MCA-15404	Software Lab-VIII(E-Commerce & Web Application Development)	-	-	4	60	40	100	2
MCA-15405	Major Project & Seminar	-	-	4	100	---	100	4
MCA-15406	Software Lab-IX(Advanced Operating Systems)	-	-	4	60	40	100	2
Total		**15**	**4**	**12**	**380**	**320**	**700**	**27**

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

Fifth Semester **Contact Hours: 31 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15501	Interactive Computer Graphics	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-III	3	1	-	40	60	100	4
MCA-15502	Web Technologies	4	1	-	40	60	100	5
MCA-15503	Object Oriented Analysis & design with UML	4	1	-	40	60	100	5
MCA-15504	Software Lab-X(Interactive Computer Graphics)	-	-	4	60	40	100	2
MCA-15505	Software Lab-XI(Web Technologies)	-	-	4	60	40	100	2
MCA-15506	Software Lab-XII(Object Oriented Analysis & design with UML)	-	-	4	60	40	100	2
Total		**15**	**4**	**12**	**340**	**360**	**700**	**25**

Sixth Semester

Course Code	Course Title	Load Allocation	Marks Distribution		Total Marks	Credits
			Internal	External		
MCA-15601	**Industry Oriented Training***	**One Week**	**100**	**-----**	**100**	**1**
	Industrial Training	**Minimum Four Months**	**200**	**300**	**500**	**24**
	Total		**300**	**300**	**600**	**25**

*During Industry Oriented Training, students will finalize their project work and report based on the industry training as per T&P Cell guidelines. The projects of students would be evaluated by their internal guides during orientation week in college.

Course Total	Marks	Credits
	4200	**164**

List of Elective-I (Core Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15307	System Programming	DEMCA-15309	Embedded Systems
DEMCA-15308	Theory of Computation		

List of Elective-II (Data Analysis Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15407	Data Warehousing & Mining	DEMCA-15409	Big Data Analytics
DEMCA-15408	ERP Systems		

List of Elective-III (Computing Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15507	Network Security & Administration	DEMCA-15509	Advanced Computer Networks
DEMCA-15508	Cloud Computing		

First Semester

MCA-15101 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 Books:

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

MCA-15102 Object Oriented Programming in C++

Section-A

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

Section-B

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

Section-C

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

Section-D

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

Suggested Readings / Books:

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

MCA-15103 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 programs : Simple numeric manipulations, Sorting of a list and use of I/O instructions.

Suggested Books:

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

MCA-15104 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 Books:

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

MCA-15105 Technical Communication

Section-A

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.

Section-B

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

Section-C

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

Section-D

Verbal Communication- Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences. Technical Communication- MS-Word, Adobe Frame maker and ROBO Help

Suggested Books:

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

MCA-15106 Software Lab-I (Information Management)

This laboratory course will mainly comprise of exercises on Section-D of the Course MCA-15101 [Information Management]

MCA-15107 Software Lab- II (Object Oriented Programming in C++)

This laboratory course will mainly comprise of exercises on what is learnt under paper: MCA-15102 **[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

1. Using input and output statements
2. Using control statements.
3. Using functions.
4. Using array
5. Using Classes and implementation of Constructor and Destructor.
6. Using files.
7. Using OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions)

Second Semester

MCA-15201 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Internal Assessment: 40
External Assessment: 60

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.

Suggested Books:

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

MCA-15202 Relational Database Management Systems

Internal Assessment: 40
External Assessment: 60

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, week Entity, Composite Entity, Strong Entity, Attribute: Types of Attribute, Relationship: Type of relationship, Connectivity, Cardinality).

Database Models and Normalization:

Section – B

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.

Distributed Databases:

Section – C

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.

Suggested Books:

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-15203 DATA STRUCTURES

Internal Assessment: 40
External Assessment: 60

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

Section-C

Heap: Definition, Structure, Algorithms and applications

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++

Suggested Books:

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

MCA-15204 DATA COMMUNICATION AND NETWORKS

Internal Assessment: 40 Marks
External Assessment: 60 Marks

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.

Network Layer

SECTION-C

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

Transport Layer

SECTION-D

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-15205 LINUX OPERATING SYSTEM

Internal Assessment: 40 Marks
External Assessment: 60 Marks

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 Processess; 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.

Suggested Books:
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-15206 Software Lab –III (Relational Database Management System)

Internal Assessment: 60
External Assessment: 40

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-15207 Software Lab –IV (Data Structures)

Internal Assessment: 60
External Assessment: 40

Note:
Programs are to be implemented in C++

Suggested Operations:

1. Creation of a data-structure
2. Deletion of a data-structure
3. Searching with a data-structure
4. Sorting of a data-structure
5. Inserting element in a data-structure
6. Removing element from a data-structure
7. Searing element in a data-structure
8. Traversing through a data-structure

Suggested Applications:

1. Reversing Data/Lists/Strings using stack
2. Convert Decimal to Binary using stack
3. Infix to Postfix Transformation using stack
4. Quick sort using stack
5. Round Ribbon algorithm implementation using queue
6. Evaluation of Postfix Expression using stack Implementing selection algorithm using heap Implementing priority queues using heap
7. Implementing sorting using heap
8. Shortest path algorithm using graphs

MCA-15208 Software Lab-V (LINUX OPERATING SYSTEM)

Internal Assessment: 60
External Assessment: 40

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-15301 Database Administration

Internal Assessment: 40
External Assessment: 60

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

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

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

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

Note: Subject Coverage will be preferably based on MySQL.

Reference Books

1. Pro SQL Server 2012 Administration, 2nd Ed by Ken Simmons, Sylvester Carstarphen (Dreamtech Press)
2. MySQL Administrator's Bible By Sheeri K Cabral, Keith Murphy (John Wiley & Sons)
3. SQL Server 2012 Bible by Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla, Aaron Nelson (Wiley India Pvt Ltd)

MCA-15302 Computer Based Optimization Techniques

Internal Assessment: 40
External Assessment: 60

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-15303 Software Engineering

Internal Assessment: 40
External Assessment: 60

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.

MCA-15304 Java Programming

Internal Assessment: 40
External Assessment: 60

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, Servlet Exception), Introduction to JSP, Syntax, Semantics, Declaration and Expressions

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

REFERENCES: -

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

Elective-I

DEMCA-15307 System Programming

Internal Assessment: 40
External Assessment: 60

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.
• Dhamdhere, 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.

Elective-I

DEMCA-15308 Theory of Computation

Internal Assessment: 40
External Assessment: 60

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

Elective-I

DEMCA-15309 Embedded Systems

Internal Assessment: 40
External Assessment: 60

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.

Note: Practical Training will be given for the clarity of contents wherever required in each section

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-15305 (Software Lab VI – Database Administration)

Internal Assessment: 60
External Assessment: 40

Implementation of various DBA roles/techniques studied in MCA-15301, like:

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

MCA-15306 S/W Lab-VII [JAVA Programming]

Internal Marks: 60
External Marks: 40

Learning Objectives:

1. To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.
2. Dealing with Array and String Programming.
3. Exception Handling.
4. Multithreading.
5. Interfaces and Package handling.
6. File Handling.
7. Applet and Swings Programming.
8. Event Handling and Graphics Programming.
9. Database Connectivity.
10. Java Server Pages.
11. Servlet and Socket (TCP & UDP) Programming.

Fourth Semester

MCA-15401 Programming Languages

Internal Assessment: 40
External Assessment: 60

Section-A

Introduction: Brief history of Programming Language, Characteristics of programming language. Programming Language Processors: structure and operation of a computer, Hardware and firmware computers, Translator and simulator computers, Syntax, semantics and virtual computers, hierarchies of computers, binding and binding time

Section-B

Elementary Data Types: variable and constants, various data types, declarations, type checking and type conversion, assignment and initialization, enumerations, Structured Data Types, vector and arrays, record, character strings, variable sized data structures, pointers and programmer-constructed data objects, sets, file and input/output

Subprogram and Programmer-Defined Data Types: Abstraction, encapsulation, information hiding, subprogram, type definitions, abstract data types

Section-C

Sequence Control: Implicit and explicit sequence control, sequence control within expression, sequence control between statements, subprogram sequence control, recursive subprogram, exceptions and exception handlers, Co-routines, scheduled subprograms, tasks and concurrent execution, data structures and sequence control. Data Control: names and referencing environments, static and dynamic scope, block structure, local data and local referencing environments, shared data, task and shared data.

Section-D

Evolution of .NET, Comparison of Java and .NET, Architecture of .NET framework, Common Language Runtime, CTS, CLS, Just-in-Time compilation, Class Libraries, Metadata, Assemblies, Garbage Collection, Application Domains, Introduction to Windows Presentation Foundation (WPF) and Windows Communication Foundation (WCF) , Silver light, Creating applications using **.**NET programming languages, Data base connectivity

References:

1. "Programming Languages design and implementation", Second edition by Terrence W. Pratt Prentice Hall of India pvt.ltd. New Delhi
2. "**.**Net Framework Essentials", by Hoang Lam, Thuan L. Thai, Published by O'Reilly Media

MCA-15402 E-Commerce & Web Application Development

Internal Assessment: 40
External Assessment: 60

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:-

1. E-Commerce Essentials by Kenneth Laudon and Carol Traver – Pearson Publication
2. Frontiers of Electronic Commerce by Ravi Kalakota, Andrew B.Whinston - Addison Wesley Publication
3. E-Commerce, Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang - Wiley India Publication
4. Web Enabled Commercial Application Development Using HTML, ,JavaScript, DHTML and PHP by Ivan Bayross BPB Publication

Elective-II

DEMCA-15407 Data Warehousing and Data Mining

Internal Assessment: 40
External Assessment: 60

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-Mediods, Hierarichal 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

Elective-II

DEMCA-15408 ERP Systems

Internal Assessment: 40
External Assessment: 60

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

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

Section-C
Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective. Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators.

Section-D
Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations. Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

References:
1. A. Lexis Leon, “Enterprise Resource Planning”, TMH
2. Brady, Manu, Wegner, “Enterprise Resource Planning”, TMH

Elective-II

DEMCA-15409 Big Data Analytics

Internal Assessment: 40
External Assessment: 60

Section-A
Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering.
Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.
Section-B
Introduction to Business Intelligence: Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? , BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics.
Big Data Analytics: Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Map-Reduce Programming, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.
Section-C
Business implementation of Big Data: Big Data Implementation, Big Data workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a business scenario, Security and Governance for Big Data,
Section-D
Big Data on Cloud, Best practices in Big Data implementation, Latest trends in Big Data, Latest trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations.
Introduction to most recent advancements in Big Data technology along with their usage and implementation with relevant tools and technologies.

Recommended books:

1. Michael Minelli, Michele Chambers, AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley CIO Series (2013), 1st ed.
2. T. white, Hadoop: The Definitive Guide, O' Reilly Media (2012), 3rd ed.

MCA-15403 Advanced Operating Systems

Internal Assessment: 40
External Assessment: 60

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:

1. Sibsankar Haldar, Alex A. Arvind, ―Operating Systems‖, Pearson Education Inc.
2. Tanenbaum and Van Steen, ―Distributed Systems: Principles and Paradigms‖, Pearson, 2007.
3. M. L. Liu, ―Distributed Computing: Principles and Applications‖, Addison-Wesley, Pearson
4. Maozhen Li, Mark Baker, ―The Grid - Core Technologies‖, John Wiley & Sons, 2005

MCA-15404 SOFTWARE LAB-VIII (E-Commerce and Web Application Development)

Internal Assessment: 60
External Assessment: 40

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:
    a. How businesses sell products & services on the web.
    b. How to reach the Consumers on the web.
    c. Online payment process.
    d. 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
    a. View bank account details, balance, download account statement etc.
    b. Electronic Fund Transfer from one account to another within a single financial institution or across multiple financial institutions.
    c. Request for cheque book, demand draft etc.
    d. Manage fixed deposits.
    e. Online Payment of Utility bills & online shopping.
8. Understanding legal aspects and issues in E-Commerce applications

MCA-15405 Major Project and Seminar

Internal Assessment: 100
External Assessment: 00

To provide the hands on experience in analyzing, designing and implementing various projects, students are assigned major projects based on the languages they have learned so far. Based on the project work a project report should be prepared under the guidance of faculty and submitted to department for evaluation.

MCA - 15406 Software Lab IX (Advanced Operating Systems)

Internal Assessment: 60
External Assessment: 40

The Software Lab will be based upon MOSIX OS

Fifth/Sixth Semester

MCA-15501 Interactive Computer Graphics

Internal Assessment: 40
External Assessment: 60

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, sub-division, 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.

Elective-III

DEMCA-15507 Network Security & Administration

Internal Assessment: 40
External Assessment: 60

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:

1. Handbook of Applied Cryptography - Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone
2. Network Security and Cryptography – Bernard Menezes
3. Network Security Essentials – William Stallings
4. Data Communication and Networking-Behrouz A. Forouzan

Elective-III

DEMCA-15508 Cloud Computing

Internal Assessment: 40
External Assessment: 60

Section-A

Cloud Computing**:** Basics of emerging cloud computing paradigm, Deployment models, Reference models, Cloud cube model, Cloud software and service providers, Cloud migration, Benefits and challenges to cloud computing, Characteristics of Clouds .Virtualization: Concept and types, Advantages of Virtualization, Taxonomy of virtualization, Physical and logical partitioning, Migration and deployment of virtual machines, XEN, QEMU, VMware, Hyper-V etc., Uses of virtual server consolidation.

Section-B

Cloud Storage: Architecture of storage (S3), Different storage models, Blobs, Buckets, Tables, ACL, Storage network design considerations, NAS and Fibre channel SANs, Global storage management locations, scalability, operational efficiency.

Section-C

Cloud Security: Trust models for clouds, Security and disaster recovery, Security base line, Fear Uncertainty Doubt and Disinformation factor, Challenges, Data center security recommendations, Statement of audit standards, Cloud security alliance, Recovery time objectives and vendor security process.

Section-D

Cloud Monitoring: Architecture for federated Cloud Computing, Service Oriented Architecture, Foundation for SLA, Components of the SLA, Selected business use cases. Demystifying the Cloud: Using case studies like Hadoop, Google App Engine, Amazon EC2, Eucalyptus, Open Nebula etc.

Recommended Books:

1. *Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing: Principles and Paradigms, John Wiley and Sons (2011).*
2. *David E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC (2011).*
3. *William von Hagen, Professional Xen Virtualization, Wrox Publications, (2008).*
4. *Chris Wolf , Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress (2005).*
5. *George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publishers (2009).*

Elective-III

DEMCA-15509 Advanced Computer Networks

Internal Assessment: 40
External Assessment: 60

Section-A

Internetworking: Half and Full Duplex Ethernet, Ethernet at the Data Link Layer, Ethernet at the Physical Link Layer, Ethernet Cabling: Straight-through, Crossover and Rolled Cable, Data Encapsulation, Three-Layer Hierarchical Network Model.

TCP Protocols: Internet Layer Protocols: IP, ICMP, ARP, RARP; Host to Host Layer Protocols: TCP, UDP; Application Layer Protocols: Telnet, FTP, TFTP, NFS, SMTP, LPD, X Window, SNMP, DNS, and DHCP.

Section-B

Switching: Overview of Switch, Unmanaged and Managed Switches, Switch Administrative Configurations, Viewing, Saving and Erasing Configurations, Spanning Tree Protocol, VLAN Basics, Static VLAN, Dynamic VLAN, Frame Tagging, Trunking Protocol, Routing between VLANs, Configuring VLANs, Configuring VLAN Trunk Ports, Configuring Inter-VLAN Routing.

Section-C

Network Routing: Overview of Router, Static and Dynamic Routing, Introduction to Classless Routing, Distance Vector Routing Protocols, Router Administrative Configurations, Router Interfaces, Viewing, Saving and Erasing Configurations, Routing Information Protocol, Configuration of EIGRP (Enhanced IGRP) and OSPF (Open Shortest Path First).

Section-D

Adhoc Networks: Features, Advantages and Applications, Adhoc versus Cellular networks, Network Architecture, Protocols: MAC protocols, Routing Protocols, Technologies, Applications of Mobile Adhoc Networks

Text Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri “Wireless and Mobile Networks: Concepts and Protocols”, Wiley India Pvt. Ltd., 2013

Reference Books:

1. Andrew S. Tanenbaum, “Computer Networks”, 5th Edition, Pearson Education, 2011.

MCA-15502 Web Technologies

Internal Assessment: 40
External Assessment: 60

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

MCA-15503 Object Oriented Analysis and Design using UML

Internal Assessment: 40
External Assessment: 60

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:

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

REFERENCE BOOKS:

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

MCA-15504 Software Lab-X (Interactive Computer Graphics)

Internal Assessment: 60
External Assessment: 40

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

MCA-15505 Software Lab-XI (Web Technologies)

Internal Assessment: 60
External Assessment: 40

The software lab will be based upon the course Web Technologies (MCA-15502).

MCA-15506 Software Lab-XII (Object Oriented Analysis & Design with UML)

Internal Assessment: 60
External Assessment: 40

The software lab will be based on UML.

Fifth/Sixth Semester

MCA-15601 Industrial Training

Internal Assessment: 300
External Assessment: 300

This semester is based on Industrial training of minimum duration of four months and one week orientation training in department of computer applications.

During Industry Oriented Training in department, students will finalize their project work and report based on the industry training as per T&P Cell guidelines. The projects of students would be evaluated by their internal guides during orientation week in college.