## MASTER OF COMPUTER APPLICATIONS (M.C.A)
### COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17
### I SEMESTER

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Objectives:

The main objectives of the course are

- Gain fundamental knowledge regarding technical concepts and practices in information technology (IT).

- Identify and evaluate current and emerging technologies and assess their applicability.

- Gain a broad background across fundamental areas of information technology along with a depth of understanding in a particular area of interest within the domain of information systems.

Outcomes

- An ability to use and apply current technical concepts and practices in the core information technologies.

- An understanding of best practices and standards and their application.

1. **The Internet and the World Wide Web**: Internet, world wide web, home page, websites, getting connected to web, browsing web, locating information on web, web multimedia.
2. **Information Technology - An Overview**: Information technology, hardware and software, information processing cycle, IT in education and training, IT in entertainment and arts, IT in science, engineering and mathematics, GPS.
3. **The computer system and central processing unit**: Types of computers, The anatomy of computer, The foundations of IT, CPU, Memory, Communications with peripherals.
4. **Input and Output, Secondary Storage, Software**: I/O devices, Storage media, backing up data, Software application programs, Types of OS, File management.
5. **Database applications**: Introduction to Databases, Database applications, queries, internet connectivity.
6. **Communications:** Network applications- FAX and Mail, LAN, WAN, Links between Networks, Modems.

7. **Multimedia, Social and Ethical Issues:** Introduction, Tools of multimedia, Multimedia on the web, viruses, IPR, Cryptography.

8. **Programming and System Development:** Programming Languages, programming methods, programming development, programming techniques.

**Text Books:**

1. Information Technology The Breaking Wave, Denis P Curtin, Kim Foley, Kunal Sen, Cathleen Morin, TMG

2. Computer Fundamentals, Anita Goel, Pearson Education India
Course Objectives:

1. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. Choose the appropriate data structure and algorithm design method for a specified application.
3. Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
4. Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions.

Course Outcomes:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
2. Demonstrate different methods for traversing trees.
3. Compare alternative implementations of data structures with respect to performance.
4. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

Syllabus:


2. **Stacks**: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions. **Queues**: Queue as an Abstract Data Type, Operations, Implementation using Arrays, Types of Queues, circular Queue, applications.


4. **Trees and Binary Trees** - Definitions and Terminology, representation of Trees, Binary Tree Terminology, Representation and Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, AVL Tree operations, Applications
5. **Searching and Hashing**: Basic Searching, Sequential Searching and its Efficiency, Transpose Sequential search, Binary Search, Interpolation Search, Hash Table structure, Hash Functions, Linear open addressing, chaining, applications.

6. **Sorting**: General Background: Efficiency of Sorting, Bubble Sort, Selection Sorting, Insertion sort, Shell Sort and Quick Sort, Heap Sort, Merge Radix Sorts and their Efficiency.


**Textbooks:**


**Reference Books:**

1. **Data Structures using C** by E. Balagurusamy, McGraw Hill Education India Pvt Limited.

1. **Sets, relations and functions**: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction.

2. Permutations and combinations; recurrence relation and generating functions.

3. **Algebraic structures and morphisms**: Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups.


5. **Mathematical logic**: Syntax, semantics of Propositional and predicate calculus, valid, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments.

6. **Proof techniques**: forward proof, proof by contradiction, contra positive proofs, proof of necessity and sufficiency.

7. **Graph Theory**: Graphs and digraphs, trees, Eulerian cycle and Hamiltonian cycle, adjacency and incidence matrices, vertex coloring, planarity.

**Text Books:**


**Reference Books:**


1. Introduction to Computer Organization, CPU Organization, Memory subsystem Organization, and Interfacing, I/O Subsystem Organization and Interfacing, a relative Simple Computer, An8085 Based Computer


5. CPU Design: Specifying a CPU, Design & Implementation of a Very Simple CPU, Short comings of the simple CPUs, Internal Architecture of the 8085 microprocessor.


**Text Book:**


**Reference Book:**

### MCA 1.5  INFORMATION SYSTEMS & ORGANIZATIONAL BEHAVIOUR

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2. Motivation: Nature and importance of motivation, Theories of motivation – Maslow’s, Herzberg’s and Mc Gregor’s X and Y Theories of Motivation.


5. Organizational Conflicts: Reasons for Conflicts, Consequences of Conflicts in Organizations, Types of Conflict, Strategies for Managing Conflicts, Organizational Climate and Culture.


**Text Books:**


**Reference Books:**

1. Organizational Behaviour – L.M.Prasad, Sultan Chand and sons
2. Management Information Systems - L.M.Prasad, Usha Prasad, Sultan Chand and sons
Course Objectives:
1. To implement stacks and queues using arrays and linked lists.
2. To develop programs for searching and sorting algorithms.
3. To write programs using concepts of various trees.
4. To implement programs using graphs.

Course Outcomes:
1. Student will be able to write programs to implement stacks and queues.
2. Ability to implement various searching and sorting techniques.
3. Ability to implement programs using trees and graphs.

List of Programs:
1. Write a program for sorting a list using Bubble sort and then apply binary search.
2. Write a program to implement the operations on stacks.
3. Write a program to implement the operations on circular queues.
4. Write a program for evaluating a given postfix expression using stack.
5. Write a program for converting a given infix expression to postfix form using stack.
6. Write a program for implementing the operations of a priority queue using dynamic allocation.
7. Write a program for the representation of polynomials using circular linked list and for the addition of two such polynomials
8. Write a program for quick sort
9. Write a program for Merge sort.
10. Write a program for Heap sort
11. Write a program to create a binary search tree and for implementing the in order, preorder, post order traversal using recursion
12. a) Write a program for finding the transitive closure of a digraph
b) Write a program for finding the shortest path from a given source to any vertex in a digraph using Dijkstra’s algorithm
MCA 1.7

COMPUTER ORGANIZATION LAB

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I – CYCLE: Digital Logic Design Experiments:

1. TTL Characteristics and TTL IC Gates
2. Multiplexers & Decoders
3. Flip-Flops
4. Counters
5. Shift Registers
6. Binary Adders & Subtractors
7. A L U

II – CYCLE: 8085 Assembly Language Programming:

1. 8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:
   - Keyboard Monitor of 8085μP Trainer.
   - Serial Monitor of 8085μP Trainer with Terminal
   - 8085 Line Assembler of 8085μP Trainer with PC as Terminal
   - 8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085μP Trainer and PC as Terminal
   - Graded Problems are to be used according to the syllabus of COMPUTER ORGANIZATION

2. PENTIUM CLASS PC ARCHITECTURE FAMILIARIZATION HARDWARE & SOFTWARE PARTS DEMONSTRATION
# MASTER OF COMPUTER APPLICATIONS (M.C.A)
## COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17

## II SEMESTER

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3. **Probability Distributions**: Discrete Distributions : Binomial, Poisson Negative Binominal Distributions And Their Properties; Continuous Distributions : Uniform, Normal, Exponential Distributions And Their Properties.

4. **Multivariate Analysis**: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, $\chi^2$ – Test For Goodness Of Fit, Test For Independence.


6. **Testing of Hypothesis**: Formulation of Null hypothesis, critical region, level of significance, power of the test;

7. **Sample Tests**: Small Sample Tests : Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

8. **Queuing Theory**: Queue description, characteristics of a queuing model, study state solutions of M/M/1: $\square$ Model, M/M/1 ; N Model, M/M/C: Model, M/M/C: N Model , Case studies

**Text Books:**

1. Probability & Statistics for Engineers and Scientists,Walpole, Myers, Myers, Ye. Pearson Education.

**Reference Book:**


4. Query Evaluation: Overview, Query processing, Query optimization, Performance Tuning.


7. Case Studies: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

Text Books:

References:
**Course Objectives:**

1. To understand Object Oriented Programming concepts, class hierarchy, characteristics of Java, inheritance and polymorphism and become familiar with the relationship between classes and objects in a Java program.
2. Learn programming based on JAVA 7 and above.
3. To write efficient and effective applications in Java, Java's event handling model, graphical user interface (GUI), swing component set, understand the relationship between the AWT and Swing.
4. Have a better understanding of Java's event model and design, build simple Graphical User Interfaces (GUI)s, Networking, Java Database Connectivity with JDBC™, Servlets, JavaServer Pages (JSP).

**Course outcomes:**

1. The course aims to make the students learn programming in Java. Java language elements and characteristics, including data types, operators, and control structures are discussed in order to make the students develop Java applications.
2. The course also intended for students who would like to learn how to develop internet based applications, graphical user interface (GUI), and graphics in both AWT and SWING.
3. Advanced Java topics discussed helps students writing programs for Java database connectivity with JDBC; Manipulating databases with JDBC; Programming for Internet, JavaServer pages.

**Syllabus:**

1. Introduction to Computers, Programming, and Java; Elementary Programming; Selections; Mathematical Functions, Characters, and Strings; Loops;
2. Methods; Single-Dimensional Arrays; Multidimensional Arrays; Objects and Classes; Object-Oriented Thinking;

3. Inheritances and Polymorphism; Exception Handling and Text I/O; Abstract Classes and Interfaces.

4. JavaFX Basics; Event-Driven Programming and Animations;

5. JavaFX UI Controls and Multimedia; Multithreading and Parallel Programming;

6. Networking; Java Database Programming;

7. Servlets; JavaServer Pages.

Text Book:

Reference Books:
2) Java And Object Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd
1. **Finite Automata and Regular Expressions**: Basic Concepts of Finite State Systems, Deterministic and Non-Deterministic Finite Automata, Finite Automata with ε-moves, Regular Expressions, Mealy and Moore Machines, Two-Way Finite Automata, Applications of FSM.


3. **Context Free Grammars and Languages**: Context Free Grammars and Languages, Derivation Trees, Simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL’s, Decision Algorithm for CFL.


5. **Turing Machines**: The Definition of Turing Machine, Design and Techniques for Construction of Turing Machines, Combining Turing Machines.

6. **Universal Turing Machines and Undecidability**: Universal Turing Machines, The Halting Problem, Variants of Turing Machines, Restricted Turing Machines, Decidable & Undecidable Problems - Post Correspondence Problem.

7. **Chomsky Hierarchy of Languages**: Regular Grammars, Unrestricted Grammars, Context Sensitive languages, Relationship between Classes of Languages.

**Text books:**

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman, Pearson Education Asia.

**Reference books:**

1. Introduction to languages and theory of computation – John C. Martin (MGH)
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)
1. **File Processing Operations**: Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C
2. **Secondary Storage**: Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access, Magnetic Tape – types, performance, organization estimation of tape length and data transmission times
3. **Journey and buffer Management**: File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks
4. **File Structure Concepts**: A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files
5. **Managing records in C files**: Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization
6. **Organizing files for performance**: Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.
7. **Indexing**: Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists
8. **Indexed sequential file access and prefix B⁺ Trees**: Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the content of the index: separators instead of keys, the simple prefix B⁺ tree, simple prefix B⁺ tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable order B⁺ tree, loading a simple prefix B⁺ tree
9. **Hashing**: Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions

**Textbooks:**

Course Objectives:

1. Provides a comprehensive introduction to computer graphics with a foundation in Graphics Applications.
2. A thorough introduction to computer graphics techniques.
3. To give the basics of Geometric Transformations and projections.
4. To introduce three dimensional concepts and object representations with color models and basics of computer animation.

Course Outcomes:

1. The students will understand graphics principles and graphics hardware.
2. The students can demonstrate geometrical transformations.
3. The students can create interactive graphics applications and demonstrate computer graphics animation.

Syllabus:


3. **Two Dimensional Transformations**: Basic 2D Transformations, Matrix Representations, Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Affine Transformations.

5. **Viewing Pipeline and Clipping operations**: Viewing Pipeline, Viewing Coordinates & Reference frames, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, Three Dimensional Viewing, View Volumes, Clipping and its Operations, Types of clipping operations: Point Clipping, Line Clipping, Polygon Clipping, Curve Clipping, Text and Exterior Clipping.

6. **Three Dimensional Concepts and Object representations**: 3D display methods, 3D Graphics, Polygon Surfaces, Curved Lines and Surfaces, Quadratic Surfaces, Super Quadrics, Blobby Objects, Spline Representations, Cubic Spline methods, Bézier Curves and Surfaces, B-Spline Curves and Surfaces.


**Text Book:**


**Reference Books:**


2. **Final Accounts**: Trading, Profit And Loss Accounts And Balance Sheet Of Sole Proprietary Concern With Normal Closing Entries. (With numerical problems)


6. **Introduction To Computerized Accounting System**: Coding Logic And Codes Required, Master Files, Transaction Files, Introduction To Documents Used For Data Collection, Processing Of Different Files And Outputs Obtained.

**Text Books:**

1. Introduction to Accountancy. T.S.Grewal.


**Reference Book:**

1. Introduction To Accounting, G.Aggarwal.
Course Objectives:

1. To develop programs using basic OOPS concepts such as classes and objects.
2. To implement programs using Inheritance concepts.
3. To implement programs using Exception handling.
4. To develop programs using operator overloading concepts.

Course Outcomes:

1. Student will be able to use OOPs concepts.
2. Ability to apply Inheritance concepts to several problems.
3. Ability to use Exception Handling concepts.

List of Programs:

1. Write a Program in JAVA that implements stack operations using classes and objects.
2. Write a Program in JAVA performing complex number addition using friend functions.
3. Write a Program in JAVA for complex number addition using operator overloading.
4. Write a Program in JAVA to perform string operations by overloading operators.
5. Write a Program in JAVA on hierarchical inheritance showing public, private and protected inheritances.
6. Write a Program in JAVA for computation of student’s result using hybrid inheritance.
7. Write a Program in JAVA implementing bubble-sort using templates.
8. Write a Program in JAVA on virtual functions.
9. Write a Program in JAVA for handling PushOnFull and PopOnEmpty Exceptions for a Stack.
10. Write a Program in JAVA for copying one file to another file using streams.
11. Write a Program in JAVA for writing and reading a class object to a file.
    a) Write program in JAVA to implement One catch block and all Exceptions
    b) using Multiple Catch blocks.
Course Objectives:
1. To introduce to a commercial DBMS such as ORACLE.
2. To learn and practice SQL commands for schema creation, data manipulation.
3. To learn conceptual and physical database design based on a case study.
4. To apply database design stages by studying a case study.

Course Outcomes:
1. The student is exposed to a commercial RDBMS environment such as ORACLE.
2. The student will learn SQL commands for data definition and manipulation.
3. The student understands conceptual through physical data base design.
4. The student takes up a case study and applies the design steps.

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include
   a. Defining Schemas for Applications,
   b. Creation of Database,
   c. Writing SQL Queries,
   d. Retrieve Information from Database,
   e. Creating Views
   f. Creating Triggers
   g. Normalization up to Third Normal Form
   h. Use of Host Languages,
   i. Interface with Embedded SQL,
   j. Use of Forms
   k. Report Writing

II. Some sample applications are given below:
1. Accounting Package for Shops,
2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library,
14. Sailors Database
15. Suppliers and Parts Database
### MASTER OF COMPUTER APPLICATIONS (M.C.A)  
#### COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17

#### III SEMESTER

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<th>Periods/week</th>
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Elective-II : Artificial Intelligence/ Compiler Design/ Image Processing/ Microprocessors/ Embedded Systems


3. **Process Synchronization**: The Critical Section Problem, Semaphores, And Classical Problems Of Synchronization, Critical Regions, Monitors, Synchronization examples

4. **Deadlocks**: principles of Deadlocks, System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection,& Recovery from Deadlocks

5. **Memory Management**: Logical Versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing


7. **Mass-storage structure**: overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

**Text Books:**


**References:**

1. **Introduction to Computer Networks:** Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

2. **Data Communications:** Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN , ATM Networks,


5. **Internet Transport Protocols:** TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.


7. **Network Devices:** Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

8. Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks

**Text Book:**


**References:**

2. Computer networks, Mayank Dave, CENGAGE.
1. Introduction to HTML, Core Elements, Links and Addressing, Images, Text, Colors and Background, Lists, Tables and Layouts, Frames, Forms, Cascading Style Sheets.

2. Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script.


4. JDBC OBJECTS- JDBC Driver Types, JDBC Packages, Database Connection, Statement Objects, Result Set.

5. JDBC and Embedded SQL - Tables, Inserting Data into Tables, Selecting Data from a Table, Meta Data, Updating Table, Deleting data from Table, Joining Table, Calculating Data, Grouping and Ordering Data, Sub queries, View.


8. Introduction to Java Beans, Using JAVA Bean Components in JSP Documents, MVC Architecture.

Text Books:

2. The complete Reference HTML and DHTML, Thomas A. Powey
3. The complete Reference J2ME, James Keogh

Reference Books:

1. Internet, World Wide Web, How to program, Dietel, Nieto, PHI/PEA
2. Web Technologies, Godbole, Kahate, 2nd Ed., TMH
1. Overview of Operations Research, Types of OR Models, Phases of Operations Research—OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis,

2. Standard Form of LPP, Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal And Dual Problems And Their Relations, Dual Simplex Method

3. Transportation Problem as LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogels Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms


8. Introduction To Simulation, Simulation Models, Event Type Simulations, Generation of Random Numbers, Monte-Carle Simulation, Simulation Of Networks; Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Text Books:


References:

2. Operations Research By S.D Sharma
4. Operations Research, Richard Bronson, Schaum’s Series, Mcgrawhill
1. Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Production System Characteristics


Text Book:

References:
1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
2. Artificial Intelligence, George F Luger, Pearson Education Publications
3. Artificial Intelligence, Robert Schalkoff, Mcgraw-Hill Publications
1. **The Theory of Automata**: Definition and description, Transition systems, properties, Acceptability of string, NDFA, Equivalence in between DFA & NDFA. Grammars, Types of Grammars, Grammars and Automata, Regular expressions, Finite Automata and Regular expressions, Regular sets and Regular Grammars.

2. **Overall view of Compilers**: Brief discussion on various phases of Compilers.

3. **Design of lexical analyzer**.


5. **Syntax Directed Translation**: Syntax directed translation and implementation, Intermediate code, Postfix notation, parsing tree, Three address Code, Quadruples, Triples.


8. **Brief discussion** on symbol tables, Run-time storage administration.

**Chapters**: 1,2,3,4,5,6,7,9,10,11,12,15 of the text book.

**Text Book**
Principles of Compiler Design by Aho, D. Ullman

**Reference Books**:
1. **Fundamentals of Image Processing**: Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity, Image Geometry, Photographic film. Histogram: Definition, decision of contrast basing on histogram, operations basing on histograms like image stretching, image sliding, Image classification. Definition and Algorithm of Histogram equalization.

2. **Image Transforms**: A detail discussion on Fourier Transform, DFT, FFT, properties, WALSH Transform, WFT, HADAMARD Transform, DCT.

3. **Image Enhancement**: (by SPATIAL Domain Methods) Arithmetic and logical operations, pixel or point operations, size operations, Smoothing Filters-Mean, Median, Mode filters – Comparative study, Edge enhancement filters – Directorial filters, Sobel, Laplacian, Robert, KIRSCΗ Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement techniques. – Comparative study, Low Pass filters, High Pass filters, sharpening filters. – Comparative Study, Comparative study of all filters, Color image processing.

4. **Image enhancement**: (By FREQUENCY Domain Methods) -esign of Low pass, High pass, EDGE Enhancement, smoothing filters in Frequency Domain. Butter worth filter, Homomorphic filters in Frequency Domain Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain.

5. **Image compression**: Definition: A brief discussion on – Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization Compression at the time of image transmission. Brief discussion on: Image Compression standards.

6. **Image Segmentation**: Definition, characteristics of segmentation.

7. Detection of Discontinuities, Thresholding Pixel based segmentation method. Region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, split and merge technique. Use of motion in segmentation (spatial domain technique only)

8. **Morphology**: Dilation, Erosion, Opening, closing, Hit-and-Miss transform, Boundary extraction, Region filling, connected components, thinning, Thickening, skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in IP

**Text Book:**

Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods Addision Wesley

**Reference books:**


7. **Host and Target Machines** – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System.


**Text Book:**


**Reference Book:**

1. Design of the Web pages using various features of HTML and DHTML

2. Client server programming using Servlets, ASP and JSP on the server side and java script on the client side

3. Web enabling of databases

4. Multimedia effects on web pages design using Flash.

5. Case Study: Design & Development of Websites with Database Connectivity and Multimedia Effects

Reference Books:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
# OPERATING SYSTEMS LAB

<table>
<thead>
<tr>
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1. Study of laboratory environment:
   - Hardware specifications, software specifications

2. Simple Unix-C programs:
   - Programs using system calls, library function calls to display and write strings on standard output device and files.

3. Programs using fork system calls.

2. Programs for error reporting using errno, perror( ) function.

3. Programs using pipes.

4. Shell programming.

5. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.

6. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.

7. Programs to simulate free space management.

8. Programs to simulate virtual memory.

10. Programs to simulate deadlock detection.

## References:

2. Unix concepts and applications, Sumitabha Das, TMH Publications.
3. Unix programming, Stevens, Pearson Education.
4. Shell programming, Yashwanth Kanetkar.
# MASTER OF COMPUTER APPLICATIONS (M.C.A)

## COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17

### IV SEMESTER

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**Elective III**: Distributed Systems/ Mobile Computing/ Design and Analysis of Algorithms

**MOOCS-I**: Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like nptel, coursera, etc. and write the examination conducted as per the university norms.

**List of topics for MOOCS-I:**

- Data Visualization using Tableau, Internet of Things, Recommender systems, Mobile Application Development, Social Network Analysis, DevOps.
1. Introduction: Confidentiality -- Data Integrity -- Authentication -- Non-Repudiation -- Overview of Issues involved.

2. Classical Encryption Techniques: Monoalphabetic, Substitution Methods, Polyalphabetic Substation Methods -- Permutation Methods -- Cryptanalysis of these Methods.


5. Introduction to Number Theory: (Basics Pertaining to Security Related Algorithms).


**Text Book:**


**Reference:**


2. Handbook of Applied Cryptography

2. **Requirements Engineering:** Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.


5. **Software Design And Architecture**

6. **Software Testing**

7. **Software Project Management**
Text Book:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill

References:


1. Introduction to Data Mining: Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.

2. Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining

3. Data Preprocessing: Pre-process the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation

4. Data Mining Primitives, Languages and system Architectures, Data Mining Primitives: What defines a Data Mining Task?, A Data Mining query language, Designing Graphical Use Interfaces Based on a Data Mining Query language, Architectures of Data Mining Systems

5. Concept Description: Characterization and comparison, Concept Description, Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases

6. Mining Association rule in large Databases, Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

7. Classification and prediction, Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case-Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy

8. Cluster Analysis: Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods

Text Book:

Data Mining Concepts and Techniques, Jiawei Han and Kamber, Morgan Kaufman Publications

Reference Books:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication

2. Data Mining Techniques, A.K.Pujari, University Press
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2. Translation of Global Queries to Fragment Queries, Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.
5. Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.
8. Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues. Transaction Management Transaction and Computation Model Multidatabase Concurrency Control, Multidatabase Recovery, Object Orientation And Interoperability Object Management Architecture CORBA and Database Interoperability Distributed Component Model COM/OLE and Database Interoperability, PUSH-Based Technologies.

**Text Books:**

1. Distributed Database Principles and Systems, Stefano Ceri, Giuseppe Pelagatti, McGraw-Hill
3. Distributed Database Principles and Systems, Stefano Ceri, Giuseppe Pelagatti, McGraw-Hill

**Reference Books:**


2. **Wireless LANs**: Introduction, Advantages and Disadvantages of WLANs, WLAN Topologies, Introduction to Wireless Local Area Network standard IEEE 802.11, Comparison of IEEE 802.11a, b, g and n standards, Wireless PANs, Hiper LAN, Wireless Local Loop


4. **Database Issues**: Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations.

5. **Data Dissemination**: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.


**TEXT BOOKS:**

Course Objectives:
On completing this course student will be able to:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:
1. Students will be able to Argue the correctness of algorithms using inductive proofs and invariants and Analyze worst-case running times of algorithms using asymptotic analysis.
2. Describe the various paradigms of design when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm and synthesize them.
3. Students will be able to Compare between different data structures. Pick an appropriate data structure for a design situation.

Syllabus


   Space and Time Tradeoffs – Sorting by Counting – Input Enhancement in string Matching – Hashing – B-Trees

5. Dynamic Programming – Computing a Binomial Coefficient – Warshall’s and Floyd’s Algorithm – Optimal Binary Search Trees - The Knapsack Problem and Memory Functions


**Text Book:**

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003

**Reference Books:**

1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, *Rational Products*. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.

2. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.

3. Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.

4. Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include

**Projects**

- Documentation including
  - A problem statement
  - A requirements document
    - A Requirements Analysis Document
    - A System Requirements Specification
    - A Software Requirements Specification
- A design document
  - A Software Design Description and a System Design Document.
- A test specification.
- Manuals/guides for
  - Users and associated help frames
  - Programmers
  - Administrators (installation instructions)

- A project plan and schedule setting out milestones, resource usage and estimated costs.
- A quality plan setting out quality assurance procedures
- An implementation.

References

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Eduaction
3. UML2 Toolkit, Hans-Erik Eriksson, etc; Wiley

****
1. 
   a. To create a data frame df1 to contain 10 observations and 3 variables, column 1 with letters, column 2 with random numbers and column 3 with first 10 natural numbers.
   b. Create df3 by merging df1 by column1 with another data frame df2 containing 20 observations and 2 variables column4 with letters, column5 with sequence of 20 real numbers from 0 to 1 in equal steps
   c. Find the dimensionality of data frame df3.
   d. Rename observations whose column1 value is ‘D’ from data frame df3

2. 
   a. Create h1 to contain 1000 random numbers, distributed in normal distribution and plot the histogram with colors.
   b. Create a data frame to contain randomly drawn samples of 25 cards from 52 distinct cards with replacements. Use ‘table’ function to find the ‘duplicated’ and tabulate the list of cards and their frequency of occurrence in the sample.

3. Write R Program using ‘apply’ group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   a. 0 to 1 range with min-max normalization.
   b. a value around 0 with z-score normalization.

2. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using ‘rbind’ and ‘cbind’ function.

3. Create a function to discretize a numeric variable into 3 quantiles and label them as low, medium, and high. Apply it on each attribute of iris dataset to create a new data frame. ‘discrete_iris’ with Categorical variables and the class label.

4. Write R program to find the approximate value of π (pi) by simulation using a large number of uniformly distributed data points with their coordinates in the range of [-1,1] and find the ratio of number of points within the circle of radius 1, to total number of data points. Observe the improvement in accuracy of result with the increased number of data points distributed.

5. Write R programs to find the probability of a variable to have a given value in different distributions like Uniform, Normal, Poisson and Binomial using ‘pnorm’, ‘ppois’, and the other such functions.

8. Apply ‘ddply’ for data summarization of iris dataset based on ‘species’ and get the same summarization using ‘sqldf’

9. After attaching data set ‘mtcars’ to access its variables, use R statements to visualize the relationship between the variables of ‘mtcars’:
   a. using scatter plots with colors.
   b. boxplots showing the spread of the variable ‘mpg’ for different values of ‘cyl’.
   c. Find correlations between all pairs of variables.
10. Write R program to implement linear and multiple regression on ‘mtcars’ dataset to estimate the value of ‘mpg’ variable, with best $R^2$ and plot the original values in ‘green’ and predicted values in ‘red’.

11. Write R program to create new variables in low dimensional space using
   a. PCA and
   b. SVD and use them for predicting the values of ‘mpg’ variable.

12. Write R Programs to apply k-mean clustering on ‘iris’ data set and get the summary statistics. Implement a mini-project to process a collection of text documents / tweets and apply tokenization, stopword removal and stemming to represent the collection as a document – term matrix reflecting the term frequencies. Cluster the documents using a simple clustering algorithm and estimate the purity of the clustering solution.
# MASTER OF COMPUTER APPLICATIONS (M.C.A)
## COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17

### V SEMESTER

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**Elective IV:** Cloud Computing / Soft Computing/ Bio-Informatics/ E-Commerce

**MOOCS-II:**

Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like nptel, coursera, etc. and write the examination conducted as per the university norms.

**List of topics for MOOCS-II:**

1. Introduction: Introduction to Wireless Networks, Various Generations of Wireless Networks, Virtual Private Networks- Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to the Internet, Blue tooth Technology, Wifi-WiMax- Radio Propagation mechanism, Pathloss Modeling and Signal Coverage

2. WIRELESS LOCAL AREA NETWORKS: Introduction-WLAN topologies-IEEE 802.11 Standards, MAC Protocols, Comparison of 802.11 a,b,g and n Standards, HIPER LAN, ZigBee 802.15.4, Wireless Local Loop


Text Books:


References:

Course Objectives:

On completing this course student will be able to

1. Understand big data and Apache Hadoop Eco system
2. Understand distributed, parallel, cloud computing and SQL concepts
3. Apply Hadoop concepts
4. Understand concepts of map and reduce and functional programming

Course Outcomes:

1. Gain conceptual understanding of analytics concepts, algorithms and statistical tests
2. Students will be able to look at the core projects used for both batch and real time data processing such as Hadoop
3. Students will be able to look at wider range of problems and data science based solutions

Syllabus:

1. **Introduction to Big Data:** Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop,
2. **Introduction to Hadoop:** Hadoop-definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker
3. **MapReduce** - A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows
4. **HDFS:** Components of Hadoop - Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system - The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives
5. **MapReduce Programming:** Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop’s API changes, Streaming in Hadoop, Improving performance with combiners.
6. **MapReduce Advanced Programming:** Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to
your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order

7. **Graph Representation in MapReduce:** Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters

**Textbooks:**


**Reference Books:**

1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop in Practice by Alex Holmes, MANNING Publishers
## MCA 5.3 Elective-IV CLOUD COMPUTING

<table>
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<th>Internal: 30 Marks</th>
<th>University Exam: 70 Marks</th>
<th>Total: 100 Marks</th>
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<tr>
<td>Instruction: 3 Periods &amp; 1 Tut/week</td>
<td>Credits: 4</td>
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4. Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.


### Text Books:


8. Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
1. Introduction: Definitions, Sequencing, Biological Sequence/Structure, Genome Projects, Pattern Recognition a Prediction, Folding Problem, Sequence Analysis, Homology and Analogy.

2. Protein Information Resources: Biological Databases, Primary Sequence Databases, Protein Sequence Databases, Secondary Databases, Protein Pattern Databases, and Structure Classification Databases.

3. Genome Information Resources: DNA Sequence Databases, Specialized Genomic Resources

4. DNA Sequence Analysis: Importance Of DNA Analysis, Gene Structure And DNA Sequences, Features Of DNA Sequence Analysis, EST (Expressed Sequence Tag) Searches, Gene Hunting, Profile of A Cell, EST Analysis, Effects Of EST Data on DNA Databases.


6. Multiple Sequence Alignment : Definition And Goal, The Consensus, Computational Complexity, Manual Methods, Simultaneous Methods, Progressive Methods, Databases of Multiple Alignments And Searching


Text Books:
1. Introduction To Bioinformatics, By T K Attwood & D J Parry-Smith
   Addison Wesley Longman

   Dreamlech India Pvt. Ltd

Reference Books:
1. Introduction To Bioinformatics By M. Lesk OXFORD Publishers (Indian Edition)
E-COMMERCE

Instruction: 3 Periods & 1 Tut/week  Credits: 4

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2. Electronic Payment Systems – Types of Electronic Payment Systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems

3. Electronic Data Inter Change, Inter Organizational Commerce - EDI, EDI Implementation, Value Added Networks.


Text Books:


References

Introduction to Information Security Fundamentals and Best Practices

- Protecting Your Computer and its Contents
- Securing Computer Networks--Basics of Networking
- Compromised Computers
- Secure Communications and Information Security Best Practices
- Privacy Guidelines
- Safe Internet Usage

Ethics in Cyber Security & Cyber Law

- Privacy
- Intellectual Property
- Professional Ethics
- Freedom of Speech
- Fair User and Ethical Hacking
- Trademarks
- Internet Fraud
- Electronic Evidence
- Cybercrimes

Penetration Testing

- Overview of the web from a penetration testers perspective
- Exploring the various servers and clients
- Discussion of the various web architectures
- Discussion of the different types of vulnerabilities
- Defining a web application test scope and process
- Defining types of penetration testing

Web Application Security

- Common Issues in Web Apps
  - What is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues

Forensics & Network Assurance

- Forensic Technologies
- Digital Evidence Collection
- Evidentiary Reporting
- Layered Defense
- Surveillance and Reconnaissance
- Outsider Thread Protection

Information Risk Management
• Asset Evaluation and Business Impact Analysis
• Risk Identification
• Risk Quantification
• Risk Response Development and Control
• Security Policy, Compliance, and Business Continuity
• Forensic investigation using AccessData FTK, En-Case

**Cyber Incident Analysis and Response**

• Incident Preparation
• Incident Detection and Analysis
• Containment, Eradication, and Recovery
• Proactive and Post-Incident Cyber Services
• CIA triangle

**Books:**

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman
3. www.nist.gov/
Module-I on Data Mining
1. Introduction to the WEKA machine learning toolkit or R programming
   Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided with WEKA.

2. Performing data preprocessing in Weka – Part 1
   Study Unsupervised Attribute Filters such as ReplaceMissingValues to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.

3. Perform data preprocessing in WEKA – Part 2
   Study the Unsupervised Instance Filters such as Remove Range filter to remove the last two instances.

4. Classification using the WEKA toolkit – Part 1
   Explore classification process using ID3 algorithm on categorical dataset(weather).
   Explore classification process using naïve Bayes algorithm on categorical dataset (‘vote’).
   Explore classification process using Random Forest algorithm on datasets containing large number of attributes.

5. Classification using the WEKA toolkit – Part 2
   Explore classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes. Generate classification rules from a small dataset. Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.

6. Performing clustering in WEKA
   a. Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality.
   b. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.
   c. Apply COBWEB clustering algorithm on categorical dataset and estimate cluster quality.

7. Association rule analysis in WEKA with different support and confidence thresholds
   Apply Association Rule Mining on supermarket dataset using Apriori Algorithm.
   Apply Association Rule Mining on supermarket dataset using FP-Growth Algorithm.
Module-II on Bigdata Analytics
1. (i) Perform setting up and Installing Hadoop in its three operating modes:
   - Standalone,
   - Pseudo distributed,
   - Fully distributed.

   (ii) Use web based tools to monitor your Hadoop setup.

Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

4. Write a Map Reduce program that mines weather data.

   Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

5. Implement Matrix Multiplication with Hadoop Map Reduce

6. Write a Map Reduce program to implement Join operations on RDBMS.

7. Write a Map Reduce program to determine statistical measures
   a) Variance
   b) Max
   c) Min
   d) Range of a large data collection.
Scope of the Mini Project:

1. Object Oriented Concepts: Requirement Engineering, Design Such as architecture, User Interface Design, Testing, Preparations User Manuals Etc and also


3. Periodical Presentations and Discussions Among the Groups and their Outputs.
### MASTER OF COMPUTER APPLICATIONS (M.C.A)
#### COURSE STRUCTURE AND SCHEME OF VALUATION W.E.F. 2016-17

#### V SEMESTER

<table>
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<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
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<td>Theory</td>
<td>Lab</td>
<td>Ext.</td>
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<tr>
<td>MCA 6.1</td>
<td>Project Work</td>
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1. **Three Stages In Project adjudication:**
   - **Stage I:** Presentation of Concept Note & Problem Approval by Guide
   - **Stage II:** Progress Approval by System Demonstration with results Internal -50 Marks
   - **Stage III:** Final Presentation with Documentation & External Viva-Voce - 50 Marks

2. Candidates can do their thesis work within the department or in any industry/research organization for two semesters (4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (CO-Guide) should be from the industry/research organization.

3. A publication of a paper on the thesis work in a National/International Conference proceedings with presentation certificate or a paper on the thesis work be communicated to a National/International Journal & accepted for publication for the submission of thesis at the end of 4th semester is desirable.

4. The external examiner shall be nominated by the Chairman, Board of Examiners in CSSE as per the norms of the University.

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