

M.P. BHOJ (OPEN) UNIVERSITY
Master of Computer Applications

Duration	Eligibility	Annual Fee
2 Year		

Course Structure & Scheme of Examination
MCA - First Year/ PGDCA

S. N.	Subject	Assignment		Theory		Total Marks	
		Max Marks	Min Marks	Max Marks	Min Marks	Max	Min
1	Data Structure Using C++	30	15	70	28	100	43
2	Python Programming	30	15	70	28	100	43
3	Numerical Methods & Statistical Anal	30	15	70	28	100	43
4	Operating System and Information Technology	30	15	70	28	100	43
5	Data Communication & Computer Networking	30	15	70	28	100	43
6	Software Engineering and UML	30	15	70	28	100	43
7	Lab: Data Structure Using C++					100	50
8	Lab: Programming in Python					100	50

M.P. BHOJ (OPEN) UNIVERSITY

MCA - First Year

MCA 101 Data Structure Using C++

Unit – I

Object Oriented Paradigms and Metaphors : Basic Concepts of Object-oriented Programming
Objects What is C++? A Simple C++ Program Initialization Input with C in Tokens Control
Statements Decisions Nesting Type Conversion.

Data Types Operators and Expressions. Tokens Basic Data Types Constants User Defined Data Types
Derived Data Types Declaration of Variables Operations and Expressions Operator and Function
Overloading Manipulation of Strings Using Operators Polymorphism Streams.

Function in C++ : The Main Function Passing Arguments to Function Returning Values From
Functions Overload Functions Inline Functions Default Arguments,

Unit – II

Class and Objects The Concept of a Class, Classes Versus Objects. Constructor and Destructor :
Constructors, Destructors, Constructors of the String Class, String Class Assignment ,String Access
Operators and Method. Operator Overloading Type Casting

Inheritance : Derived Class Relationships Superclass/Subclass Multiple Inheritance Constructors,
Destructors, and Inheritance Hierarchical Inheritance Hybrid Inheritance Virtual Base Classes.

Unit – III

What Are Pointers? C++ Memory Map Free Store Pointers and Arrays Reserving Dynamic Memory
Freeing Dynamic Memory Polymorphism Virtual Functions Pure Virtual Functions Early vs. Late
Binding.

Input-Output in C++ :Old Vs. Modern C++I/O C++ Streams Creating Inserters Creating Extractors
Creating Manipulator Functions.

File Handling in C++ Classes for File Stream Operations Opening and Closing A File Manipulations
of File Pointers Random Access Command-Line Arguments. Standard Library Objects The
Container Classes Theory of Operation Vectors Lists Maps Algorithms The String Class.

Unit IV

Data Structures, Primitive and Composite Data types, Abstract Data Type, Algorithm Design,
Program Analysis, Stacks, Representation of Stacks, Application of Stacks, Simulating Recursive
Function Using Stack, Queues, Circular Queue, Deques, Priority Queues. Linked List, Static and
Dynamic Memory Allocation, Pointers, Static and Dynamic Variables, Linear Linked List,
Representation of Linked List, Implementation of Linked List, Concatenation of Linked List,
Merging of Linked List, Reversing of Linked List, Application of Linked List, Doubly Linked List,
Circular Linked List, Generalized List.

Unit – V

Trees, Basic Terminology, Binary Trees, Theorems Associated with Binary Trees, Binary tree Traversal, Implementation of Binary Trees, Deleting From a Binary Tree., Graphs, Definition and Terminology, Representation of Graphs, Path Matrix1, Traversal of Graph, Weighted Graphs, Spanning Trees

Hash Table, Hashing Function, Terms Associated with Hash Tables bucket Overflow, Handling bucket Overflows, ISAM, Searching, Sorting.

References :

E. Balaguruswamy, "Object Oriented Programming in C++", TMH.

Robert Lafore, "Object Oriented Programming in C++", Pearson.

M.T. Somashekar, D.S. Guru, " Object-Oriented Programming with C++", PHI.

Herbert Schildt, "The Complete Reference C++", Tata McGraw Hill publication.

Varsha H. Patil "Data Structure Using C++" Oxford.

Rajesh K. Shukla "Data Structures Using C & C++" Wiley India.

Reema Thareja " Data Structure Using C " Oxford.

D. S Malik "Data Structure Using C++ " Second Edition Cengage.

Kushwaha and Mishra "Data Structure: A programming Approach with C", PHI Learning. A. K Sharma "Data Structure Using C" Pearson.

Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Computer Science Press

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MCA- First -Year

MCA 102 Python Programming

UNIT I

Introduction to Python, use IDE to develop programs, Basic coding skills, working with data types and variables, working with numeric data, working with string data, Python functions, Boolean expressions, selection structure, iteration structure, working with lists, work with a list of lists, work with tuples, work with dates and times, get started with dictionaries

CONTROL FLOW, FUNCTIONS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT II

LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: Sorting and Searching

Classes in Python: OOPS Concepts, Classes and objects , Classes in Python, Constructors, Data hiding, Creating Classes, Instance Methods, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes, Iterators, generators and decorators.

UNIT III

FILES, MODULES, PACKAGES

I/O and Error Handling In Python :Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Handling IO Exceptions, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Working with Directories.

UNIT IV

An Introduction to relational databases: SQL statements for data manipulation, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event, working with components.

UNIT V

Implement Machine Learning algorithms: Usage of Numpy for numerical Data, Usage of Pandas for Data Analysis, Matplotlib for Python plotting, Seaborn for Statistical plots, interactive Dynamic visualizations, SciKit for Machine learning.

Suggested Reading:

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach,2016
2. Haltermanpython Mark Lutz, Programming Python, O'Reilly, 4th Edition,2010.
3. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, 2017
4. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", SecondEdition, Shroff O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
5. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python - Revised andUpdated for Python 3.2, Network Theory Ltd., Edition2011

M.P. Bhoj (Open) University

MCA- First Year

MCA- 103 Numerical Methods and Statistical Analysis

Unit – I

Introduction, Limitation of Number Representation, Arithmetic rules for Floating Point Numbers, Errors in Numbers, Measurement of Errors, Solving Equations, Introduction, Bisection Method, Regula Falsi Method, Secant Method, Convergence of the iterative methods.

Unit – II

Interpolation, Introduction, Lagrange Interpolation, Finite Differences, Truncation Error in Interpolation, Curve Fitting, Introduction, Linear Regression, Polynomial Regression, Fitting

Unit – III

Numerical Differentiation and Integration, Introduction, Numerical Differentiation Formulae, Numerical Integration Formulae, Simpson's Rule, Errors in Integration Formulae, Gaussian Quadrature Formulae, Comparison of Integration Formulae, Solving Numerical Differential Equations, Introduction, Euler's Method, Taylor Series Method, Runge-Kutta Method, Higher Order Differential Equations.

Unit – IV

Introduction to Statistical Computation, History of Statistics, Meaning and scope of Statistics, Various measures of Average, Median, Mode, Geometric Mean, Harmonic Mean, Measures of Dispersion, Range, Standard Deviation, Probability Distributions, Introduction, Counting Techniques, Probability, Axiomatic or Modern Approach to Probability, Theorems on Probability, Probability Distribution of a Random Variable, Mean and Variance of a Random Variable, Standard Probability Distributions, Binomial Distribution, Hyper geometric Distribution Geometrical Distribution, Uniform Distribution (Discrete Random Variable), Poisson Distribution, Exponential Distribution, Uniform Distribution (Continuous Variable), Normal Distribution

Unit – V

Estimation, Sampling Theory, Parameter and Statistic, Sampling Distribution of Sample Mean, Sampling Distribution of the Number of Successes, The Student's Distribution, Theory of Estimation, Point Estimation, Interval Estimation, Hypothesis Testing, Test of Hypothesis, Test of Hypothesis Concerning Mean, Test of Hypothesis Concerning Proportion, Test of Hypothesis Concerning Standard Deviation

REFERENCE BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, New Delhi, 2015.
2. James Stewart ,calculus,7th edition
3. Miller and M. Miller, Mathematical Statistics, Pearson Education Inc., Asia 7th Edition,New Delhi,
4. Richard Johnson, Miller and Freund's Probability and Statistics for Engineer, Prentice Hall of India Private Ltd., 8th Edition, New Delhi, 2011.
5. D.C. Agarwal ,Discrete Structure, 5th edition, Bhopal

M.P. BHOJ (OPEN) UNIVERSITY

MCA- First Year

MCA 104 Operating System and Information Technology

UNIT I

Operating Systems: Evolution (History of evolution of OS with the generations of computers), Types of operating systems, Multitasking, Timesharing, Multithreading, Multiprogramming and, Real time operating systems, Different views of the operating system, System Programmer's view, User's view, Operating system concepts and structure, Layered Operating Systems, Monolithic Systems.

Processes: The Process concept, The process control block, Systems programmer's view of processes, Operating system services for process management, Scheduling algorithms, First come first serve, Round Robin, Shortest run time next, Highest response ratio next, Multilevel Feedback Queues, Performance evaluation of scheduling algorithms stated above

UNIT II

Memory Management: Memory management without swapping or paging, Concepts of swapping and paging, Page replacement algorithms namely, Least recently used, Optimal page replacement, Most recently used, Clock page replacement, First in First out (This includes discussion of Belady's anomaly and the category of Stack algorithms), Modeling paging algorithms, Design issues for paging system, Segmentation, Segmented Paging, Paged Segmentation

UNIT III

Inter-process Communication and Synchronization: The need for inter-process synchronization, Concept of mutual exclusion, binary and counting semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem, Critical section, critical region and conditional critical region, Monitors and messages. Deadlocks: Concepts of deadlock detection, deadlock prevention, deadlock avoidance. Banker's Algorithm

UNIT IV

File System: File systems, directories, file system implementation, security protection mechanisms. Input/output: Principles of I/O Hardware: I/O devices, device controllers, direct memory access. Principles of I/O software: Goals interrupt handlers, device drivers, and device independent I/O software. User space I/O Software. Disks: Disk hardware, Disk scheduling algorithms (namely First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms) Error handling, track-at-a-time caching, RAM Disks. Clocks: Clock hardware, memory-mapped terminals, I/O software.

UNIT V

Information Security: Introduction, malicious programs, cryptography, digital signature, Firewall, Users Identification and Authentication, Security awareness and policies, Application areas requiring security. Mobile Commerce: Introduction, Growth, Success Stories of Mobile commerce, Technologies for mobile commerce, M-commerce in India, Digital Marketing.

Computing and Cloud Computing: History of Centralized and Distributed Computing, Overview of Distributed Computing, Cluster computing, Grid computing. Introduction to Cloud Computing- Cloud issues and challenges - Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage.

UNIT VI

Introduction to IoT: Characteristics of IoT, physical design of IoT, Logical design of IoT, Functional blocks of IoT, home Automation, Industry applications, Surveillance and other IoT applications. Introduction to Virtual Reality (VR): Definition, Application of VR, Smart Systems, Embedded Systems.

Artificial Intelligence: Concept of Artificial Intelligence, Introduction to branches of Artificial Intelligence: Machine Learning, Neural Network, Robotics, Natural Language Processing, Expert System, and Fuzzy Logic. Applications of all the branches of AI, General application of AI.

Books

1. Milenkovic, M., "Operating Systems - concepts and Design" McGraw Hill International Edition Computer Science series 1992.
2. Galvin P., J.L. Abraham Silberschatz. "Operating System Concepts". John Wiley & Sons Company, 1989. 4. Tanenbaum, A.S. "Modern Operating System", Prentice Hall of India Pvt. Ltd.1995.
3. William Stallings "Operating Systems" , Prentice Hall of India Pvt. Ltd.
4. Fundamental of Information Technology by Alex Leon & M.Leon, Vikas Publications, New Delhi
- 5 . Security in Computing (Third Edition) by C.P. Pfleeger, S.L. Pfleeger,D.N. Shah, S. Ware, Prentice Hall 2002.
6. Introduction to Information Technology - ITL Education Solutions Ltd.,Seventh Impression, Pearson Education 2008.
7. Cloud Computing PHI by Rao M.N.
8. Internet of Things, McGrawHill by Raj Kamal Books

M.P. Bhoj (Open) University

MCA- First -Year

MCA 105 Data Communication and Computer Networking

Unit – I

Fundamentals of Data Communication : Analog Versus Digital, Fundamentals of Data Transmission Communication Modes Transmission System, Synchronous System, Communication Channels- Modems : Classification of Modems Modem Based on Range Modems Based on Line Modems Based on Operation Mode Modems Based on Synchronization Modems Based on Modulation.

Data Transmission Protocol : Protocols An Overview of Networking The Role of Computer Networks in Development, Transmission Media : Introduction Transmission Concepts and Terms Master Sites Interconnection to Telephone.

Unit – II

Local Area Network : Local Area Network Baseband Versus Broadband LAN Hardware LAN Operating Systems.

Implementing LAN : Implementation of LAN Using Fiber-Optic Cables Implementation of LAN Using Wireless Technology Fast LANs Non-standard LANs.

Extending LAN : Transmission Concepts and Terms, Master sites, Interconnection to Telephone.

Unit – III

Data Transmission Network : Telephone Networks, Wan Technologies. TCP/IP and the Internet : History of Internet, Internet2 Internet Services Standards for TCP/IP and the Internet RFCs and the TCP/IP Standardization Process. Network Architectures and OSI, Network Architectures Layering the Communications Process The Need for Layered Solutions Open Systems Interconnection (OSI) Model. Routing and Congestion Control : Routing Concepts Routing in Wide Area Networks Hop By-Hop versus Source Routing Congestion Control, Deadlocks. Queueing Theory: Basic Design Techniques : Basic Concepts, Queueing Model and Factors Traffic Theory Lost Call Rate.

Unit – IV

Wide Area Network : Introduction Network Using WAN and Network Services Communication Protocols Over WAN. Transmission Control Protocol/Internet Protocol (TCP/IP) : LAN Protocol and OSI TCP/IP Protocol Data Transmission by TCP and Ethernet Data Encapsulation Data Routing TCP/IP Services and Application Protocols. Data Link Layer Address : Physical Address. Naming, Addressing, and Routing : Network Layer Addresses Subnet Address Resolution Protocol (ARP) Domain Name System (DNS).

Unit – V

Broadband Network Local Loop Technologies Asymmetric Digital Subscriber Line (ADSL) High Bit-Rate Digital Subscriber Line (HDSL), Line Coding Techniques Wireless Local Loop (WLL).

Security : Basic Requirements of Network Security, Security Levels Data Security Invalid Access/
Possibility of Eavesdropping Firewalls (Access Control) Encryption Security Against Remote
Access. Electronic Mail and other Internet Services : Electronic Mail E-Mail Addresses Format of A
Mail Message Some Important Features of E-Mail Services Available on The Internet, Electronics
Commerce and EDI, Electronic Commerce Internet: A Tool for Electronic Commerce Electronic
Data Interchange (EDI), Implementing EDI - Major Considerations User Characteristics and
Electronic Commerce , Issues in Electronic Commerce.

BOOKS

1. A.S.Tanenbaum, "Computer Network", 4th edition,PHI
2. Forouzan "Data Communication and Networking 3ed", TMH
3. J.F.Hayes, "Modeling and Analysis of Computer Communication Networks", Plenum Press
4. D.E.Comer, "Internetworking with TCP/IP", Volume Ist & IInd, PHI
5. Willium Stalling, "Data & Computer communications",Maxwell Macmillan International
Ed. 6. D.Bertsekas and R.Gallager,"Data Networks", 2nd Ed. ,PHI.
7. G.E. Keiser ,"Local Area Networks ", McGraw Hill, International Ed.
8. Joh R. Vacca, "Wireless Broadband Networks Handbook 3G, LMDS and Wireless Internet"
Tata McGraw-Hill, 2001

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MCA- First -Year

MCA 106 Software Engineering and UML

UNIT I

Introduction Software Engineering paradigms – Waterfall Life cycle model – Spiral Model – Prototype Model– Software Requirement - Requirements Elicitation Techniques – Initial Requirements Document -- SRS Document – Requirements Change Management - Project Management

UNIT II

Software Design Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Development of Detailed Design & Creation of Software Design Document - Dataflow Oriented design – Designing for reuse – Programming standards.

UNIT III

Software Metrics & Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Reliability – Software Quality Assurance – Standards. Need of Software Estimation – Function Point – Risk Management

UNIT IV

Software Testing And Maintenance & Software Testing Fundamentals – Software testing strategies – Black Box Testing – White Box Testing – System Testing – Functional Testing – Structural Testing – Regression Testing - Testing Tools – Test Case Management – Challenges of Software Maintenance – Types of Maintenance. Software Maintenance Organization – Maintenance Report

UNIT V

Unified Modeling Language

Introduction to UML : Use Case Approach: Identification of Classes and Relationships, Identifying State and Behavior, Use Case Diagram Class Diagram – State Diagram - Sequence Diagram – Activity Diagram – Deployment Diagrams Case Study - LMS

UNIT VI

ALGORITHM DESIGN AND ANALYSIS

Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall's Algorithm for Finding Transitive Closure.

UNIT VII ADVANCED ALGORITHM DESIGN AND ANALYSIS

Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem-Amortized Analysis

Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw Hill Education, 8th Edition, 2015.
2. I. Sommerville, "Software Engineering", Sixth Edition, Addison Wesley-Longman, 2004.
3. Pankaj Jalote, "An Integrated approach to Software Engineering", Second Edition, Springer Verlag, 1997.
4. Timothy C. Lethbridge and Robert Laganieri, "Object – Oriented Software Engineering, Practical Software Development using UML and Java", Tata McGraw Hill Publishing Company Limited, Second Edition, 2004
5. Ullman "Analysis and Design of Algorithm" TMH
6. Goodman "Introduction to the Design & Analysis of Algorithms, TMH-2002.
7. Aho, "Data Structure & Algorithms
- 8.

Suggested List of Experiments

- 1) Write a program to find out the largest number using function.
- 2) Write a program to find the area of circle, rectangle and triangle using function overloading.
- 3) Write a program to implement complex numbers using operator overloading and type conversion.
- 4) Write a program using class and object to print bio-data of the students.
- 5) Write a program which defines a class with constructor and destructor which will count the number of objects created and destroyed.
- 6) Write a program to implement single and multiple inheritances taking student as the sample base class.
- 7) Write a program to add two private data members using friend function.
- 8) Write a program using dynamic memory allocation to perform 2x2 matrix addition and subtraction.
- 9) Write a program to create a stack using virtual function.
- 10) Write a program that store five student records in a file.
- 11) Write a program to search an element in the array using Linear and Binary Search.
- 12) Write a program to perform the following operation in Matrix:
 1. Addition 2. Subtraction 3. Multiplication 4. Transpose
- 13) Write a program to perform the following operation on strings using string functions:
 1. Addition 2. Copying 3. Reverse 4. Length of String
- 14) Write program for implementing the following sorting methods to arrange a list of integers in ascending order:
 - a) Quick sort b) Selection sort c) Insertion sort d) Merge sort
- 15) Write a program that uses stack operations to convert a given infix expression into its postfix equivalent.
- 16) Write a program to merge two sorted arrays into one sorted array.
- 17) Write a program to implement stack using array and linked list.
- 18) Write a program to implement a queue and circular queue using arrays.
- 19) Write a program to insert an element in the beginning and end of a singly linked list.
- 20) Write a program to insert an element at any position in a singly and doubly linked list.
- 21) Insert and delete a node at any position in a doubly linked list.
- 22) Write a program that uses functions to perform the following:
 - a) Create a binary search tree of integers.

MCA 108 Lab: Programming in Python

Suggested List of Experiments

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. To write a Python Program to find the maximum from a list of numbers.
5. To write a Python Program to perform Linear Search
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. To write a Python Program to perform insertion sort.
9. To write a Python Program to perform Merge sort.
10. To write a Python program to find first n prime numbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. To write a Python program to simulate elliptical orbits in Pygame.
15. To write a Python program to bouncing ball in Pygame
16. Write a python program to reverse a string.
17. Write a python program to perform following operation using lists:
 - a. append elements in the list
 - b. compare two lists
 - c. convert list to dictionary
18. Write a Program to transpose a table/pandas data frame.
19. Write a NumPy program to create a 3x3 matrix with values ranging from 2 to 10.
20. Write a python program to perform following operation on Data Frame:
 - a. Create two different Data Frames and perform the merging operations on it.
 - b. Create two different Data Frames and perform the grouping operations on it.
 - c. Create two different Data Frames and perform the concatenating operations on it
21. Program to check regular expression pattern is matching with string or not in Python
22. Create a sample dataset and apply the following aggregation function on it: mean(), median() Mean and median min(), max() Minimum and maximum std(), var() Standard deviation and variance sum() Sum of all items
23. Write a python program to get row wise proportion using crosstab () function.
24. Write a python program to display a bar chart of the popularity of programming languages.
25. Write a python program to create a bar plot of scores by group and gender. Use multiple X values on the same chart for men and women.

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Master of Computer Applications

Duration	Eligibility	Annual Fee
2 Year		

Course Structure & Scheme of Examination MCA- Second Year

S. N.	Course Code	Subject	Assignment		Theory		Total Marks	
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
1	MCA 201	DBMS and Data Mining	30	15	70	28	100	43
2	MCA 202	Big Data and Big Data Analysis	30	15	70	28	100	43
3	MCA 203	Artificial Intelligence and Machine Learning	30	15	70	28	100	43
4	MCA 204	Advanced Web Technology	30	15	70	28	100	43
5	MCA 205 (P)	DBMS Lab					100	50
6	MCA 206 (P)	Advanced Web Technology Lab					100	50
7	MCA 207	Project	Max Marks: 200 Min Marks: 100					

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MCA II Year

MCA 201 DBMS and Data Mining

UNIT- I

Introduction: Advantage of DBMS approach, various view of data, data independence, schema and subschema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture. ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

UNIT II

Domains, Relations and Keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. Relational Algebra & SQL: Features of good relational database design, Codd's rule, The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, modification of Database, join relations, DDL in SQL. PL/SQL programming: working with stored procedures, triggers, cursor Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.

UNIT III

Functional Dependencies and Normalization: basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth normal form.

UNIT IV

Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity-log based recovery, deferred Database modification, immediate Database modification, checkpoints. Distributed Database: basic idea, distributed data storage, data replication, data fragmentation: horizontal, vertical and mixed fragmentation.

UNIT V

Emerging Fields in DBMS: object oriented Databases-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing-terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval, continuous media data, multimedia data formats, video servers. Storage structure and file

organizations: overview of physical storage media, magnetic disk performance and optimization, basic idea of RAID, file organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparison of the three models.

UNIT –V I

Motivation, importance, Data type for Data Mining : relation Databases, Data Warehouses, Transactional databases, advanced database system and its applications, Data mining Functionalities: Concept/Class description, Association Analysis classification & Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

UNIT – VII

Data Warehouse and OLAP Technology for Data Mining: Differences between Operational Database Systems and Data Warehouses, a multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.

Recommended Books:

1. A Silberschatz, H.F Korth, Sudersan “Database System Concepts” –, MGH Publication.
2. C.J Date “An introduction to Database Systems” –6th ed.
3. Elmasri & Navathe “Fundamentals of Database systems” – III ed.
4. B.C. Desai. “An introduction to Database systems” BPB
5. Raghurama Krishnan “Database Systems” TMH
6. J. Han and M. Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Pub.
7. Berson “Dataware housing, Data Mining & DLAP, @004, TMH.
8. W.H. Inmon “ Building the Datawarehouse, 3ed, Wiley India.
9. Anahory, “Data Warehousing in Real World”, Pearson Education.
10. Adriaans, “Data Mining”, Pearson Education. 6. S.K. Pujari, “Data Mining Techniques”, University Press, Hyderabad

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MCA II Year

MCA 202 Big Data and Big Data Analysis

UNIT I

INTRODUCTION TO DATA SCIENCE AND BIG DATA: Introduction to Data Science – Data Science Process – Exploratory Data analysis – Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data – Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics– Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to Data Visualization.

UNIT II

DATA ANALYSIS USING R Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-Way cross Tabulation.

UNIT III

DATA MODELING Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS VsMongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations

UNIT IV

DATA ANALYTICAL FRAMEWORKS Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop.

UNIT V

STREAM ANALYTICS Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window

UNIT VI

INTRODUCTION TO BIG DATA Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics – Validating – The Promotion of the Value of Big Data – Big Data Use Cases- Characteristics of Big Data Applications – Perception and

Quantification of Value -Understanding Big Data Storage – A General Overview of High-Performance Architecture – HDFS – MapReduce and YARN – Map Reduce Programming Model

UNIT VII

CLUSTERING AND CLASSIFICATION Advanced Analytical Theory and Methods:
Overview of Clustering – K-means – Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions .- Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Trees in R – Naïve Bayes – Bayes' Theorem – Naïve Bayes Classifier.

Recommended Books:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press,
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.
3. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers.
5. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press
6. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers "CRC Press,

M.P. BHOJ (OPEN)UNIVERSITY

MCA II Year

MCA 203 Artificial Intelligence and Machine Learning

UNIT I

General Issues and Overview of AI: The AI problems, what is an AI technique, Characteristics of AI applications. Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables, iteration and recursion, property lists and arrays.

UNIT II

Problem Solving, Search and Control Strategies General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search. Heuristic Search Techniques Hill climbing, branch and bound technique, best first search & A* algorithm, AND / OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems.

UNIT III

Knowledge Representations First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT IV

Natural Language processing Parsing techniques, context free grammar, recursive transitions nets (RNT), augmented transition nets (ATN), case and logic grammars, semantic analysis. Game playing Minimax search procedure, alpha-beta cutoffs, additional refinements. Planning Overview an example domain the block world, component of planning systems, goal stack planning, non linear planning.

UNIT V

Probabilistic Reasoning and Uncertainty Probability theory, bayes theorem and bayesian networks, certainty factor. Expert Systems Introduction to expert system and application of expert systems, various expert system shells, vidwan frame work, knowledge acquisition, case studies, MYCIN. Learning Rote learning, learning by induction, explanation based learning

UNIT VI

Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis function and testing, data distributions, data pre-processing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.

UNIT VII

Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, back propagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters.

Recommended Books:

1. Elaine Rich and Kevin Knight "Artificial Intelligence" - Tata McGraw Hill.
2. "Artificial Intelligence" 4 ed. Pearson
3. Dan W. Patterson "Introduction to Artificial Intelligence and Expert Systems", Prentice India.
4. Nils J. Nilson "Principles of Artificial Intelligence", Narosa Publishing House.
5. Clocksin & C.S.Melish "Programming in PROLOG", Narosa Publishing House.
6. M.Sasikumar,S.Ramani etc. "Rule based Expert System", Narosa Publishing House

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MCA II Year

MCA 204 Advance web technology

UNIT I

Responsive web design and introduction to Bootstrap : Bootstrap grid, bootstrap components and plugins.

UNIT II

XML Introduction to XML, Comparing XML with HTML, Describing the Structure of XML - Declaration, Elements, Attributes, Comments, CDATA, XML Entity References, Parsers ,Describing Document Type Definitions, Using XSLT with XML :xsl:template Element, xsl:apply-templates Element,xsl:import , xsl:include Element, Element,xsl:element Element, xsl:attribute Element, xsl:value-of Element, using Conditional Statements, Sorting Elements, XSLTfunctions, Creating Well-formed and Valid Documents.

UNIT III

Introduction to Ajax – AJAX Web Application Model, Working of AJAX, Asynchronous Data Transfer with XMLHttpRequest - Creating the XMLHttpRequest Object, XMLHttpRequest Properties, XMLHttpRequest Methods, Using the XMLHttpRequest Object in Different Browsers, Reading a File Synchronously, Reading a File Asynchronously, Performing Tasks Using the XMLHttpRequest Object, Integrating PHP and AJAX-Sending Data from a Web Application to a Server, Validating a Field Using AJAX and PHP

UNIT IV

Handling XML Data using PHP and AJAX-JavaScript, properties for Extracting with nodeValue, Accessing XML, Elements by Name, Accessing Attribute Values in XML Elements. Validating XML Documents in Ajax Applications Retrieving Data from a Database Using PHP and AJAX Consuming Web Services Using AJAX-Exploring Web Service Protocols-SOAP,Web Service Description Language, UDDI, REST, Consuming Web Services Using AJAX

UNIT V

jQuery-JavaScript DOM objects their methods and properties-Window, History, Location Document, Form etc. Fundamentals of jQuery, Loading and using jQuery, using jQuery Library files, Call-back functions, jQuery Selectors , jQuery Methods to Access HTML Attributes, jQuery Methods of traversing, jQuery Manipulators, jQuery Events, jQuery Effects, jQuery with AJAX.

Recommended Books:

1. Bootstrap: Responsive Web Development
2. XML: A Beginner's Guide by Steven Holzner
3. AJAX For Beginners , Ivan Bayross and Sharanam Shah, SPD
4. Web Development with jQuery (WROX) by Richard York
5. Learning PHP, MySQL & JavaScript with j Query,
- 6 CSS & HTML – by Robin Nixon ,SPD
7. Ajax in Action Dave Crane, Eric Pascarello, Darren James
8. Ajax for Dummies Steve Holzner,PhD, Wiley Publishing Inc.

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M.P. BHOJ(OPEN)UNIVERSITY

MCA II Year

MCA 204 (P) Advance web technology Lab

Suggested List of Practicals:

1. Design a PHP program to print reverse of any number.
2. Design a PHP script for uploading a file to the server and display the uploaded files details.
3. Create a simple XML document to display the address book.
4. Create a xml document and database for importing and exporting xml document into database.
5. Create a XML program for Internal DTD(Document Type Definition) creation.
6. Create a program to change the content of the web page using AJAX.
7. Create a program to implement the concept of asynchronous javascript XML for webpage login process.
8. Create a program in AJAX using JavaScript, DHTML and the XML HttpRequest object to perform a GET or POST and return a result without reloading the HTML page.

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Suggested List of Practicals :

1. Create the following Databases.

Salesmen

SNUM	SNAME	CITY	COMMISSION
1001	Piyush	London	12 %
1002	Sejal	Surat	13 %
1004	Miti	London	11 %
1007	Rajesh	Baroda	15 %
1003	Anand	New Delhi	10 %

SNUM : A unique number assigned to each salesman.

SNAME : The name of salesman.

CITY : The location of salesmen.

COMMISSION: The Salemen's commission on orders.

Customers

CNUM	CNAME	CITY	RATING	SNUM
2001	Harsh	London	100	1001
2002	Gita	Rome	200	1003
2003	Lalit	Surat	200	1002
2004	Govind	Bombay	300	1002
2006	Chirag	London	100	1001
2008	Chinmay	Surat	300	1007
2007	Pratik	Rome	100	1004

CNUM : A unique number assigned to each customer.

CNAME : The name of the customer.

CITY : The location of the customer.

RATING : A level of preference indicator given to this customer.

SNUM : The number of salesman assigned to this customer

Orders

ONUM	AMOUNT	ODATE	CNUM	SNUM
3001	18.69	10/03/97	2008	1007
3003	767.19	10/03/97	2001	1001
3002	1900.10	10/03/97	2007	1004
3005	5160.45	10/03/97	2003	1002
3006	1098.16	10/03/97	2008	1007
3009	1713.23	10/04/97	2002	1003
3007	75.75	10/04/97	2004	1002
3008	4723.00	10/05/97	2006	1001
3010	1309.95	10/06/97	2004	1002
3011	9891.88	10/06/97	2006	1001

ONUM : A unique number assigned to each order.

AMOUNT : The amount of an order.

ODATE : The date of an order.

CNUM : The number of customer making the order.

SNUM : The number of salesman credited with the sale

Write queries :-

1. Produce the order no, amount and date of all orders.
2. Give all the information about all the customers with salesman number 1001.
3. Display the following information in the order of city, sname, snum and commission.
4. List of rating followed by the name of each customer in Surat.

5. List of snum of all salesmen with orders in order table without any duplicates.
6. List of all orders for more than Rs. 1000.
7. List of names and cities of all salesmen in London with commission above 10%.
8. List all customers whose names begins with a letter 'C'.
9. List all customers whose names begins with letter 'A' to 'G'.
10. List all orders with zero or NULL amount.
11. Find out the largest orders of salesman 1002 and 1007.
12. Count all orders of October 3, 1997.
13. Calculate the total amount ordered.
14. Calculate the average amount ordered.
15. Count the no. of salesmen currently having orders.
16. List all salesmen with their % of commission.
17. Assume each salesperson has a 12% commission. Write a query on the order table that will produce the order number, salesman no and the amount of commission for that order
18. Find the highest rating in each city in the form :
For the city (city), the highest rating is : (rating)
19. List all in descending order of rating.
20. Calculate the total of orders for each day and place the result in descending order.
21. Show the name of all customers with their salesman's name.
22. List all customers and salesmen who shared a same city.
23. List all orders with the names of their customer and salesman.
24. List all orders by the customers not located in the same city as their salesman.
25. List all customers serviced by salespeople with commission above 12%.
26. Calculate the amount of the salesman commission on each order by a customer with rating above 100.
27. Find all pairs of customers having the same rating with out

duplication.

28. List all orders that are greater than the average of October 4, 1997.
29. Find the average commission of salesmen in London.
30. Find all orders attributed to salesmen in 'London' using both the subquery and join methods.
31. List the commission of all salesmen serving customers in 'London'.
32. Find all customers whose cnum is 1000 above than the snum of Sejal.
33. Count the no. of customers with the rating above than the average of 'Surat'.
34. Find all salesmen with customers located in their cities using ANY and IN.
35. Find all salesmen for whom there are customers that follow them in alphabetical order.
36. Find all customers having rating greater than any customer in 'Rome'.
37. List all orders that has amount greater than atleast one of the orders from 6th October, 1997.
38. Find all orders with amounts smaller than any amount for a customer in 'London'.
39. Find all the customers who have greater rating than every customer in 'Rome'.
40. Create a union of two queries that shows the names, cities and ratings of all customers. Those with rating of ≥ 200 should display 'HIGH RATING' and those with < 200 should display 'LOW RATING'.
41. Produce the name and number of each salesman and each customer with more than one current order in the alphabetical order of names.
42. Create union of three queries. First select snum of all salesman in Surat, second, the cnum of all customers in 'Surat' and third, the onum of all orders of 3rd Oct. Retain duplicates between the last two queries but remove the duplicates between either of them and the first..
43. Remove all orders from customer Chirag from the orders table.

44. Set the ratings of all the customers of Piyush to 400.

45. Increase the rating of all customers in Rome by 100.