Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Computer Applications

Name of the Program: MCA

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teacher Assessment*	END SEM University Exam	Teacher Assessment*
MCA201	DCC	Object Oriented Programming using Java	3	0	2	4	60	20	20	30	20

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.
***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:

To familiarize the students with Object Oriented Methodology.

1. Students must be able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
2. Students must have the ability to write a computer program to solve specified problems.
3. Students must be able to use the Java SDK environment to create, debug and run simple Java programs.
4. Students must learn the concepts of JDBC and concepts of OOPs using Java.

Course Outcomes:

- Understand different programming paradigms, Evolution of programming languages, Programming styles.
- Differentiate and compare structured and object oriented approach. Also understand OO design and analysis concepts.

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- Design efficient solutions for real world problems.
- Explain the concept of class and objects with access control to represent real world entities.
- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Use overloading methodology on methods and constructors to develop application programs.
- Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
- Describe the backend connectivity process in java program by using JDBC drivers. 14. Develop Java application to interact with database by using relevant software component (JDBC Driver).
- Understand the process of graphical user interface design and implementation using AWT or swings.

UNIT - I

OOP concepts: Classes And Objects, Data Abstraction, Encapsulation, Inheritance, Benefits of Inheritance, Polymorphism, Procedural and Object Oriented Programming Paradigm. Java Programming: History of Java, Language Construct of Java Including Keywords, Constants, Variables, Looping and Decision Making Construct, Introduction to JVM and its Architecture, Overview of JVM Programming.

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UNIT – II

Introducing Classes, Objects and Methods: Defining a Class, Adding Variables and Methods, Creating Objects, Constructors, Arrays and String: Creating an Array, One and Two Dimensional Arrays, String Array and Methods, String and String Buffer Classes, Wrapper Classes.

Inheritance: Inheritance Hierarchies, Super and Subclasses, Member Access Rules, Super Keyword, Preventing Inheritance: Final Classes and Methods, The Object Class and Its Methods;

Polymorphism: Dynamic Binding, Method Overriding, Abstract Classes and Methods;

UNIT – III

Interface: Interfaces VS Abstract Classes, Defining an Interface, Implement Interfaces, Extending Interface; **Packages:** Defining, Creating and Accessing a Package, Importing Packages.

Exception Handling: Fundamentals Exception Types, Uncaught Exceptions, Throw, Throw, Final, Built in Exception, Creating Your Own Exceptions.

Multithreaded Programming: Fundamentals, Java Thread Model: Priorities, Synchronization, Messaging, Thread Classes, Runnable Interface, Inter Thread Communication, Suspending, Resuming and Stopping Threads.

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UNIT-IV

Input/Output Programming: Basics, Streams, Byte and Character Stream, Predefined Streams, Reading and Writing from Console and Files.

JDBC: Introduction to DBMS and JDBC API, Application Architecture, Obtaining a Connection, JDBC Models: Two Tier and Three Tier Model, ResultSet, Prepared Statement, Callable Statement.

UNIT-V

The Collection Framework: The Collection Interface, Collection Classes, Working with Maps& Sets.

Networking: Basics, Networking Classes **a**nd Interfaces, Using Java.Net Package, RMI (Remote Method Invocation).

List of Experiments:

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to thatinteger.
2. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
3. Write a Java program to define and demonstrate class and constructors.
4. Write a Java program for sorting a given list of names in ascending order.

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5. Write a Java Program to find Reverse of the string.
6. Write a Java program to sort a given integer array.
7. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (use String Tokenizer class).
8. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
9. Write a Java program that displays the number of characters, lines and words in a text file.
10. Write a Java program for creating multiple threads a) Using Thread class. b) Using Runnable interface.
11. Write a Java program that illustrates how run time polymorphism is achieved.
12. Write a Java program that illustrates the following a) Creation of simple package. b) Accessing a package. c) Implementing interfaces.
13. Write a Java program that illustrates the following a) Handling predefined exceptions. b) Handling user defined exceptions.
14. Write a Java program for TCP/IP client Server using Socket.
15. Program to demonstrate event handling.

Text Books:

1. Herbert Schildt, “The complete Reference Java, Seventh Edition, Mc Grew Hills, 2007.

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2. E. Balagurusawmy, “Programming With Java - A Primer, Fourth Edition, 2010.
3. Daniel Liang, “Introduction to Java Programming”, Seventh Edition, Pearson, 2010.
4. Cay S. Horstmann, “Core Java Volume I-Fundamentals”, Eleventh Edition, Prentice Hall, 2018.
5. Kathy Sierra & Bert, “Head First Java, Second Edition”, Shroff/O’Reilly, 2005.
6. Paul Dietel and Harvey Deitel, “Java How to Program”, PHI, Eighth Edition, 2010.

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MCA202	DCC	Computer Networks	3	0	0	3	60	20	20	0	0

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Course Objectives:

- To develop an understanding basics of networking and modern network architecture.
- To introduce students various data link layer protocols and error detection and correction mechanism.
- To describe major concepts involved in local-area networks (LANs), and wireless LANs (WLANs).
- To provide knowledge about wide-area networks (WANs) and TCP/IP.
- To get introduce security features and mechanisms in networking.

Course Outcomes:

After completion of the course student would be able to:

- Know and apply basics of networking more efficiently, securely, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.
- Define different protocols and analyze what errors might occur and how to control network errors.
- Define and differentiate among various types of LAN configurations and apply them to meet the changing and challenging networking needs of organizations.
- Get familiar with the concept of wide area networks and internet protocols.
- Analyze why networks need security and how to apply control mechanism of security.

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MCA202	DCC	Computer Networks	3	0	0	3	60	20	20	0	0

UNIT - I

Computer Network: Data Communication, Computer Network, Network Topologies, Layered Network Architecture-ISO-OSI Model, Transmission Media: Guided and Unguided, Multiplexing, Modem & Modem Types

UNIT – II

Framing – Flow and error control, Data Security and Integrity: Parity Checking Code, Cyclic redundancy checks (CRC), Hemming Code, Protocols for Noise less and Noise Channels, Concepts, Basic flow control, Sliding window protocol-Go-Back-N protocol and selective repeat protocol. Wired LAN, IEEE Standards: Standard Ethernet, Fast Ethernet, Gigabit Ethernet.

UNIT - III

Connecting LANs: Backbone Networks, Virtual LANs, Virtual-Circuit Networks: Architecture and Layers of Frame Relay and Introduction to ATM.

Token Ring : 802.5 IEEE standard, Token Bus : 802.4 IEEE standard, FDDI Protocol, DQDB Protocol, Inter-Networking, Layer 1 connections-Repeater, Hubs, Layer 2 connections-Bridges, Switches, Layer 3 connections-Routers, Gateways.

UNIT-IV

Wide Area Network: Introduction, Network routing, Routing Tables, Types of routing, Dijkstra‟s Algorithm, Open shortest path first, Flooding, Broadcasting, Multicasting.

Internet Protocols, Overview of TCP/IP, Transport protocols, Elements of Transport Protocol, Transmission control protocol (TCP), User data-gram protocol (UDP).

UNIT-V

Network Security: Cryptography – Symmetric key and Public Key algorithms - Digital Signature – Management of Public keys – Communication Security – Authentication Protocols.Virtual Terminal

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MCA202	DCC	Computer Networks	3	0	0	3	60	20	20	0	0

Protocol, Firewalls, Fire wall policies and rules, Common Problem with Packet Filtering.Overview of DNS- E-mail – FTP – WWW – HTTP – Multimedia. IP Management Protocol, SNMP.

Text Books:

1. Andrew S. Tanenbaum, "Computer Network", 5th Edition, Pearson Education India, 2013
2. Behrouz A. Forouzan, "Data Communications and Networking" 5th Edition, TATA McGraw Hill, 2013

Reference Books:

1. Douglas E. Comer, "Internetworking with TCP/IP", Pearson, 6th Edition, 2013
2. William Stallings, "Data and Computer Communications", Pearson, 10thEdition, 2013

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MCA203	DCC	Database Management Systems	3	0	2	4	60	20	20	30	20

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***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:

- To provide students with basic concepts in information system and the benefits of these systems
- To provide the knowledge of systems definition, systems requirements and information needed by the decision maker
- To understand the role, requirement and operations that an analyst needed to analyze, design, and implement the systems
- To identify several methods to enhance and develop information systems and to manage the information system recourses
- To explain several ethical issues in information system
- To provide the knowledge of business data modeling for the designing of efficient information systems
- To explain the various issues related with Data Security.

Course Outcomes: After completing this course the student will be able to:

- To differentiate between data, information, and knowledge
- Create, maintain and manipulate a relational database using SQL
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing an information system
- Describe the characteristics of database transactions
- Understand the transaction processing system and functional area information system
- To design the efficient database system using normalization
- Define the information systems and differentiate information systems Identify the threats to information security and to protect information recourses

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MCA203	DCC	Database Management Systems	3	0	2	4	60	20	20	30	20

- Analyze the basic concepts and architecture associated with DBMS
- To analyze any environment to determine their tables to construct database
- Information systems that support organization, management, Decision making
- To plan, acquire, and maintain information systems.

UNIT-I

Introduction: Introduction to Databases and Transactions, Purpose of Database System- Database System, Database system Vs file system, Database System concepts and architecture, Advantage of DBMS approach, various view of data, data independence, schema and subschema and instances, primary Database languages, Database administrator and users, data dictionary.

UNIT-II

Concepts of data models, **ER model:** basic concepts, notation for ER diagram, design issues, mapping constraint, Concepts of keys: super, candidate, primary, alternate, foreign, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables, reduction of ER diagrams to tables, extended ER model, relationships of higher degree.

Unit III

Relational data Model and Language:

Relational Algebra: concepts, domains, relations, kind of relations, relational database, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, The structure, relational algebra with extended operations, modifications of Database.

Relational Calculus: idea of relational calculus, tuple and domain calculus, Domain relational Calculus, calculus Vs algebra, computational capabilities.

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Unit IV

Relational Database Design: basic concepts and definitions, trivial and non-trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, Canonical Cover.

Normalization: Introduction, non-loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multi valued dependencies and fourth normal form, Join dependency and fifth normal form. Codd's rules, Relational Schemas, Introduction to UML, Alternative approaches to database design.

UNIT-V

SQL: Introduction, basic structure of SQL, Characteristics and Advantage of SQL set operations, aggregate functions, null values, SQL data types and literals. SQL operators, Types of SQL commands. Nested sub queries, derived relations, modification of Database, Aggregate functions. Insert, update and delete operations. Triggers in SQL.

Views: Introduction to views, data independence, security, updates on views, comparison between tables and views

Distributed Database: basic idea, distributed data storage.

Concepts of **Transaction, concurrency and Recovery:** basic concepts, ACID properties, Transaction states, Implementation of atomicity and durability, concurrent executions.

List of Experiments:

1. To study Basic SQL commands (create database, create table, use, drop, insert) and execute the following queries using these commands:
   - Create a database named ' Employee'.
   - Use the database 'Employee' and create a table 'Emp' with attributes 'ename', ecity', 'salary', 'enumber','eaddress','depttname'.

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- Create another table 'Company' with attributes 'cname', ccity','empnumber' in the database 'Employee".

2 To study the viewing commands (select , update) and execute the following queries using these commands:

- Find the names of all employees who live in Delhi.
- Increase the salary of all employees by Rs. 5,000.
- Find the company names where the number of employees is greater than 10,000.
- Change the Company City to Gurgaon where the Company name is 'TCS'.

3. To study the commands to modify the structure of table (alter, delete) and execute the following queries using these commands:

- Add an attribute named ' Designation' to the table 'Emp'.
- Modify the table 'Emp', Change the datatype of 'salary' attribute to float.
- Drop the attribute 'depttname' from the table 'emp'.
- Delete the entries from the table ' Company' where the number of employees are less than 500.

4. To use (and, or, in , not in, between , not between , like , not like) in compound conditions and execute the following queries using them:

- Find the names of all employees who live in 'Gurgaon' and whose salary is between Rs. 20,000 and Rs. 30,000.
- Find the names of all employees whose names begin with either letter 'A' or 'B'.
- Find the company names where the company city is 'Delhi' and the number of employees is not between 5000 and 10,000.
- Find the names of all companies that do not end with letter 'A'.

5. Using aggregate functions execute the following queries:

- Find the sum and average of salaries of all employees in computer science department.
- Find the number of all employees who live in Delhi.
- Find the maximum and the minimum salary in the HR department.

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6. To execute the following queries using study the grouping commands (group by, order by)

List all employee names in descending order.

- Find number of employees in each department where number of employees is greater than 5.
- List all the department names where average salary of a department is Rs.10,000.

7. To write SQL queries

Alter table 'Emp' and make 'enumber' as the primary key.

- Alter table 'Company' and add the foreign key constraint.
- Add a check constraint in the table 'Emp' such that salary has the value between 0 and Rs.1,00,000.
- Alter table 'Company' and add unique constraint to column cname.
- Add a default constraint to column ccity of table company with the value 'Delhi'.
- Rename the name of database to 'Employee1'.
- Rename the name of table 'Emp' to 'Emp1'.
- Change the name of the attribute 'ename' to 'empname'.

8. To execute following queries using appropriate

Retrieve the complete record of an employee and its company from both the table using joins.

- List all the employees working in the company 'TCS'.

9. To study the various set operations and execute the following queries using these commands:

- List the enumber of all employees who live in Delhi and whose company is in Gurgaon or if both conditions are true.
- List the enumber of all employees who live in Delhi but whose company is not in Gurgaon.

10. To study the various scalar functions and string functions (power, square, substring, reverse, upper, lower, concatenation) and execute the following queries using these commands:

- Reverse the names of all employees.
- Change the names of company cities to uppercase.
- Concatenate name and city of the employee.

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11. To study the commands for views and execute the following queries using these commands:
    - Create a view having ename and ecity.
    - In the above view change the ecity to 'Delhi' where ename is 'John'.
    - Create a view having attributes from both the tables.
    - Update the above view and increase the salary of all employees of IT department by Rs.1000.

12. To study the commands involving indexes and executes the following queries:
    - Create an index with attribute ename on the table employee.
    - Create a composite index with attributes cname and ccity on table, company.
    - Drop all indexes created on table,company.

Text Books:

1. A Silberschatz, H.F Korth, Sudersan, "Database System Concepts", 6th Edition, MGH Publication 2013.
2. C.J. Date, "An introduction to Database Systems", 6th Edition, Pearson 2003.
3. Elmasri & Navathe, "Fundamentals of Database systems",7th Edition, Pearson 2015.
4. B.C. Desai, "An introduction to Database systems", BPB.
5. Raghu Ramakrishnan, "Database Management Systems",3rd Edition, TMH 2014.

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MCA204	DCC	Operating Systems	3	0	0	3	60	20	20	0	0

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Course Objectives:

- To provide knowledge of the underlying principles, techniques and approaches of designing an operating systems.
- To provide the knowledge of inherent functionality and processing of program execution.
- To emphasize on how the various elements that underlie operating system interact and provides services for execution of application software
- To make the students aware with the different Operating Systems.
- To provide introduction to UNIX Operating System and its File System.

Course Outcomes (COs): After the completion of the course student will be able to

- Understand the functions, structures and history of operating systems.
- Understand the design issues associated with operating systems.
- Understand and apply various process management concepts including scheduling, synchronization, deadlocks and multithreading.
- Demonstrate the concepts of memory management including virtual memory.
- Master system resources sharing among the users.
- familiar with various types of operating systems.
- Students will demonstrate knowledge of process control, threads, concurrency, memory management scheduling.

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MCA204	DCC	Operating Systems	3	0	0	3	60	20	20	0	0

- Demonstrate the architecture and features of UNIX Operating System and distinguish it from other Operating System

UNIT - I

Introduction: Evolution of OS with the generations of computers. Goals, Objectives, Functions of Operating System, Types of operating systems: Batch Processing, Multitasking, Multithreading, Multiprogramming and Real time operating systems etc. Different views of the operating system, Operating System structure: Layered Operating Systems, Monolithic Systems.

UNIT – II

CPU Scheduling: Processes, The Process concept, process states, the process control block. Types of scheduler, scheduling criteria, scheduling algorithms, performance evaluation of scheduling algorithms. **Deadlocks:** Deadlock, Condition for deadlock, Deadlock Prevention, Deadlock detection, Deadlock avoidance, Deadlock recovery, Starvation.

UNIT - III

Memory Management : Memory management without swapping or paging, Fragmentation, Concept and benefits of Virtual memory, Swapping and Paging, Page replacement algorithms, Design issues for paging system, Segmentation.

UNIT-IV

Concurrency and Synchronization: The need for inter-process synchronization, Principles of concurrency, Requirement for Mutual Exclusion, Decker's algorithms, Critical section, Semaphore, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem,

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							THEORY			PRACTICAL	
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MCA204	DCC	Operating Systems	3	0	0	3	60	20	20	0	0

UNIT-V

Unix/Linux Operating System: Development of Unix/Linux, Role and Functions of Kernel, System Calls, Elementary Linux command and Shell Programming, Directory Structure, System administration

Case study: Linux, Windows Operating System

Text Books:

1. Deitel, H.M., "An Introduction to Operating Systems". Addison Wesley Publishing, Second edition, 2002.
2. Milenkovic, M., "Operating Systems - concepts and Design" McGraw Hill International, ISE Edition, 1992.
3. Galvin P., J.L. Abraham Silberschatz. "Operating System Concepts". John Wiley & Sons, Seventh edition, 2009.
4. Tanenbaum, A.S. "Modern Operating System", Prentice Hall of India Pvt. Ltd, Third edition, 2009.
5. Maurice J. Bach “Design of UNIX O.S. “, PHI Learning, 2015.
6. YashavantKanetkar, “Unix Shell programming”, 1stEdition, BPB Publisher, 2010.

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MCA205	AEC	Artificial Intelligence and Machine Learning	3	0	0	3	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall exceed 10 Marks)

Course Objectives:

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Experience AI development tools such as an "AI language", expert system shell, and/or data mining tool.
- Experiment with a machine learning model for simulation and analysis.
- Explore the current scope, potential, limitations, and implications of intelligent systems.

Course outcomes:

- Upon successful completion of this course, the student shall be able to:
- Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
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MCA205	AEC	Artificial Intelligence and Machine Learning	3	0	0	3	60	20	20	0	0

- Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
- Demonstrate proficiency in applying scientific method to models of machine learning.
- Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

UNIT-I

Overview of AI:

A historical perspective of Artificial intelligence, The AI problems, AI technique, Characteristics of AI applications. Turing Test, Physical symbol system hypothesis. Applications of Artificial Intelligence.A brief introduction to LISP and PROLOG programming.

UNIT-II

Problem Solving: The concept of state space, production systems, control strategies forward and backward chaining; Heuristics. Blind Search: Depth First and Breadth First search.
Heuristic Search: Hill climbing, Steepest Ascent Hill Climbing, Best First search, A* and AO* search. Constraint satisfaction problems.

UNIT-III

Knowledge Representation: First order predicate logic, Skolemization, resolution principle & unification, inference mechanisms. Semantic networks, frame systems and value inheritance, scripts and conceptual dependency.

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MCA205	AEC	Artificial Intelligence and Machine Learning	3	0	0	3	60	20	20	0	0

UNIT-IV

Natural Language processing and Neural Networks: NLP: Parsing techniques, Chomsky Hierarchy, Context Free Grammar, case and logic grammars, semantic analysis. A brief overview of Neural Networks and Applications of neural networks.

UNIT-V

Fuzzy Logic, Machine Learning and Expert Systems: Introduction to expert system and application of expert systems, case studies: MYCIN and DENDRAL. A brief overview of fuzzy logic, machine learning, deep learning and their applications.

Text Books:

1.Elaine Rich and Kevin Knight “Artifical Intelligence” -Tata McGraw Hill, Third Edition
2.Dan W. Patterson “Introduction to Artifical Intelligence and Expert Systems”, Prentice Hall of India, 2007
3. Deepak Khemani, “ A first course in Artificial Intelligence”, McGraw Hill Education, 2017.

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MCA206	DCC	Data Structures	3	0	2	4	60	20	20	30	20

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:

- To get a good understanding of applications of Data Structures.
- The analysis and evaluation of the data structure needs of particular problems;
- To provide knowledge of the fundamental design, analysis and implementation of data structures and algorithms
- Creation of new data structures.
- To familiarize the students with the analysis and design a particular problem**.**

Course Outcomes: students will be able to

- Demonstrate familiarity with major algorithms and use of appropriate data structures.
- Analyze performance of algorithms.
- Determine which algorithm or data structure to use in different scenarios
- Be familiar with writing recursive methods.
- Apply programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
- Demonstrate understanding of various searching algorithms.

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MCA206	DCC	Data Structures	3	0	2	4	60	20	20	30	20

UNIT - I

The Concept of Data Structure, Abstract Data Type, Concept of List and Array, Introduction to Stack, Stack as an Abstract Data Type, Primitive Operations on Stack, Stack's Applications - polish notations Infix, Postfix, Prefix and Recursion, evaluation of post and prefix expressions.. Introduction to Queues, Primitive operations on Queues, Circular Queue, Priority Queue, Applications of Queue.

UNIT - II

Linked List - Introduction to Linked List, Memory Representations of Linked List, comparison; Operations on Linked List, Linked Representation of Stack and Queue, Doubly Linked List, Applications of Linked List.

UNIT –III

Trees: Definition, Basic Terminology of Trees, Tree Representations as Array and Linked. Binary Trees, Binary Tree Operations. Traversal of Binary Trees - Inorder, Preorder & Postorder, complete binary tree, Application of Binary Tree, Threaded Binary tree, Height Balanced tree, B-tree.

UNIT-IV

Complexity: concept and notations. Searching: Sequential Search, Binary Search and their Comparison. Sorting - External and Internal Sorting, Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Comparison of Sorting Methods. Hashing;

UNIT-V

Graphs - Introduction to Graphs, Basic Terminology, Directed, Undirected and Weighted graph, Representation of Graphs, Graph Traversals - Depth First and Breadth First Search. Applications of Graphs: Minimum Cost Spanning Tree, and Shortest Path Problem: Kruskals and Dijkstra algorithms.

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MCA206	DCC	Data Structures	3	0	2	4	60	20	20	30	20

List of Experiments:

1. Write a program to create a two dimensional array and perform add, subtract and multiplication operations.
2. Write a program to create a two dimensional array using dynamic memory allocation.
3. Write a program to implement stack.
4. Write a program to convert infix expression into postfix expression.
5. Write a program to check balanced parentheses for a given infix expression.
6. Write a program to evaluate postfix expression.
7. Write a program to implement queue.
8. Write a program to implement circular queue.
9. Write a program to implement link list with insert, delete, search, view, and delete function.
10. Write a program to implement ordered link list.
11. Write a program to add two polynomials.
12. Write a program to create doubly link list.
13. Write a program to implement tree with insert, delete and search function.
14. Write a program for in order, post order and preorder traversal of tree.
15. Write a program for binary search and sequential search using recursion.
16. Write a program for bubble sort and sequential search.
17. Write a program for insertion sort and quick sort.

							TEACHING & EVALUATION SCHEME	
							THEORY	PRACTICAL

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MCA206	DCC	Data Structures	3	0	2	4	60	20	20	30	20

Text Books:

1. Kruse R.L , "Data Structures and Program Design in C" , 2nd edition, Pearson Education, (2006) PHI.
2. Tanenbaum A.M.,"Data Structures using C & C++", Wiley (2019)PHI
3. YashwantKanetkar, "Data Structures through", BPB (2019)
4. Horowitz &Sahni, "Fundamentals of Data Structures in C" , 2nd edition, Universities Press, (2008)
5. Lipschuitz Seymour, "Data Structure", Schaum 's Outline Series, 1st Edition, McGraw Hill publication, 2017
6. Tremblay, Jean-Paul, "An introduction to data structures with applications", McGraw-Hill
7. Horowitz &Sahni, "Fundamentals of Data Structures", Galgotia Publishers.

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