



# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Shri Vaishnav Institute of Computer Applications

### Name of the Program: MCA (Artificial Intelligence and Machine Learning)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
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.

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### 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 and 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 that integer.
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.

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4. Write a Java program for sorting a given list of names in ascending order.
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 StringTokenizer 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.

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MCA201	DCC	Object Oriented Programming using Java	3	0	2	4	60	20	20	30	20

### Text Books:

1. Herbert Schildt, "The complete Reference Java, Seventh Edition,Mc Graw Hills, 2007.
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), Hamming 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

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”, 5<sup>th</sup> Edition, Pearson Education India, 2013
2. Behrouz A. Forouzan, “Data Communications and Networking” 5<sup>th</sup> Edition, TATA McGraw Hill, 2013

#### Reference Books:

1. Douglas E. Comer, “Internetworking with TCP/IP”, Pearson, 6<sup>th</sup> Edition, 2013
2. William Stallings, “Data and Computer Communications”, Pearson, 10<sup>th</sup> Edition, 2013

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	PRACTICAL
MCA204N	DCC	Principles of Operating Systems	3	0	0	3	60	20	20	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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MCA204N	DCC	Principles of 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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MCA204N	DCC	Principles of 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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MCA205N	AEC	Advanced Python Programming for AI & ML	3	0	2	4	60	20	20	30	20

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**Course Objectives:** The objective of this course is to provide students

- an understanding of advanced concepts of Python Programming
- an understanding on Mathematical calculations on data of data science & Machine learning.
- an understanding on data framing and data visualization.
- an understanding on real world applications using advanced python.

**Course outcomes:** After completion of this syllabus students will be able to

- Apply the principles of Advanced concepts of Python.
- Write clear and effective python code for Machine Learning.
- Create applications using python programming.
- Apply NumPy , Pandas and Matplotlib of advanced python concepts.
- Apply Web Application frameworks like Django / Flask.



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MCA205N	AEC	Advanced Python Programming for AI & ML	3	0	2	4	60	20	20	30	20

### UNIT-I

#### Database Programming with SQLite / MySQL

Python MySQL / SQLite Database Connectivity. Create database, create table, insert data into table, inserting multiple records into table, extracting data from the table, updating table record and delete table data.

### UNIT-II

#### NumPy : Numerical Python

Python list vs NumPy arrays, Creating a NumPy Array, Basic ndarray, Shape of NumPy array, Size of NumPy array, Array of zeros, Array of ones, Random numbers in ndarray, The Shape and Reshaping of NumPy Array, Dimensions of NumPy array, Reshaping a NumPy array, Flattening a NumPy array, Transpose of a NumPy array, Indexing and Slicing of NumPy Array, NumPy Ufuncs, Maths with NumPy Arrays, Mean, Median and Standard deviation, Min-Max values and their indexes, Sorting in NumPy Arrays, NumPy Arrays and Images.

### UNIT-III

#### Pandas (Data Manipulations)

Pandas Series, Pandas DataFrames, Common Operations in Pandas, How To Deal With Missing Data in Pandas, How To Merge DataFrames in Pandas, How To Join DataFrames in Pandas, How To Concatenate DataFrames in Pandas. Data Input and Output in Pandas, How To Save Pandas DataFrames. Data visualization.

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MCA205N	AEC	Advanced Python Programming for AI & ML	3	0	2	4	60	20	20	30	20

### UNIT-IV

#### Matplotlib and Seaborn ( Data Visualization)

Installing Matplotlib , Line Chart, Scatter Plot ,Bar Graph, Histogram, Subplots , Pie Chart , Matplotlib with Pandas and Numpy. specify color, markings and line styles, adjust thickness, label and legend, save the graph, legend () , title(). Installing Seaborn, Load Datasets To Construct Seaborn Plots, Histogram, Bar Plot, Count Plot, Joint Plot, Regplot, Lm Plot, KDE Plot, Box Plot, Violin Plot, Heatmap, Pair Plot.

### UNIT-V

#### Regular Expressions and Web Programming ( Flask / Django)

Introduction to re module , Pattern matching, searching, splitting, substitution, Meta characters: . ^ \$ \* + ? { } [ ] | () , Groups and capturing , File parsing using regex.

Introduction to Flask / Django web framework, Setting up a simple web server , Route definitions and request handling , Form submission and templates , Basic CRUD with Flask / Django

#### Text Books:

1. Luciano Ramalho, *Fluent Python*, 2nd Edition, O'Reilly Media, 2021
2. David Beazley and Brian K. Jones, *Python Cookbook*, 3rd Edition, O'Reilly Media, 2013.
3. Brett Slatkin, *Effective Python: 90 Specific Ways to Write Better Python*, 2nd Edition, Addison-Wesley, 2019.
4. Michal Jaworski and Tarek Ziadé, *Expert Python Programming*, 4th Edition, Packt Publishing, 2023.
5. Micha Gorelick and Ian Ozsvald, *High Performance Python*, 2nd Edition, O'Reilly Media,

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# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Shri Vaishnav Institute of Computer Applications

### Name of the Program: MCA (Artificial Intelligence and Machine Learning)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCA206N	DCC	Advanced 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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### 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

**Searching and Sorting:** Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.

**Hashing:** Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing

### UNIT-V

**Graph:** Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations

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Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.

#### 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.

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### Text Books:

1. Kruse R.L , “Data Structures and Program Design in C” , 2<sup>nd</sup> edition, Pearson Education, (2006) PHI.
2. Tanenbaum A. M., “Data Structures using C & C++”, Wiley (2019) PHI
3. Yashwant Kanetkar, “Data Structures through”, BPB (2019)
4. Horowitz & Sahni, “Fundamentals of Data Structures in C” , 2<sup>nd</sup> edition, Universities Press, (2008)
5. Lipschultz Seymour, “Data Structure”, Schaum 's Outline Series, 1<sup>st</sup> 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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