# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Shri Vaishnav Institute of Computer Applications

### Name of the Program: M.Sc. in Computer Science

| COURSE CODE | CATEGORY | COURSE NAME | L | T | P | CREDITS | TEACHING & EVALUATION SCHEME | | | | |
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| | | | | | | | THEORY | | | PRACTICAL | |
| | | | | | | | END SEM University Exam | Two Term Exam | Teacher Assessment* | END SEM University Exam | Teacher Assessment* |
| MCA202 | DCC | Computer Networks | 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 be exceed 10 Marks)

**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.

| COURSE | CATEGORY | COURSE NAME | L | T | P | C | D | TEACHING & EVALUATION SCHEME |
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Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examination
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

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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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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, 10th Edition, 2013.

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| MCA204N | DCC | Principles of Operating Systems | 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.

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**Course Objectives:**

1. To provide knowledge of the underlying principles, techniques and approaches of designing an operating systems.
2. To provide the knowledge of inherent functionality and processing of program execution.
3. To emphasize on how the various elements that underlie operating system interact and provides services for execution of application software
4. To make the students aware with the different Operating Systems.
5. 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**

1. Understand the functions, structures and history of operating systems.
2. Understand the design issues associated with operating systems.
3. Understand and apply various process management concepts including scheduling, synchronization, deadlocks and multithreading.
4. Demonstrate the concepts of memory management including virtual memory.
5. Master system resources sharing among the users.
6. familiar with various types of operating systems.
7. 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 |

8. 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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| 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

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**UNIT-V**

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

| | | | | | | | TEACHING & EVALUATION SCHEME |
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16. Write a program for bubble sort and sequential search.
17. Write a program for insertion sort and quick sort.

**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. Yashwant Kanetkar, "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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| MSCCS204 | SEC | Object Oriented Programming with Core Java | 3 | 0 | 2 | 4 | 60 | 20 | 20 | 30 | 20 |

**Course Education Objectives (CEOs):**

- Students must be able to understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Students must be able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Students must have the ability to write a computer program to solve specified problems.
- Students must be able to use the Java SDK environment to create, debug and run simple Java programs.

**Course Outcomes (COs):**

After the successful completion of the course students will be able to perform the following tasks:

- Write, compile, and execute Java programs that may include basic data types and control flow constructs using Integrated Development Environments (IDEs) such as Eclipse, NetBeans, and JDeveloper.
- Write, compile and execute Java programs using object oriented class structures with parameters, constructors, and utility and calculations methods, including inheritance, test classes and exception handling.
- Write, compile, and execute Java programs using arrays and recursion, manipulating Strings and text documents.
- Write, compile, and execute Java programs that include GUIs and event driven programming.
- Write a final project that may be selected from among the following: applets for inclusion in web pages; applets to access enterprise data bases in robust, enterprise three level applications; secure communications over the internet; or an approved project chosen by the student.

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| MSCCS204 | SEC | Object Oriented Programming with Core Java | 3 | 0 | 2 | 4 | 60 | 20 | 20 | 30 | 20 |

**UNIT – I**

Importance and features of Java, *Language Construct of java including* Keywords, constants, variables and looping and decision making construct, Classes and their implementation, Introduction to JVM and its architecture including set of instructions. Overview of JVM Programming. Internal and detailed explanation of a valid .class file format. Instrumentation of a .class file.

**UNIT - II**

**Introducing classes, objects and methods:** defining a class, adding variables and methods, creating objects, constructors.

class inheritance: super class, sub class, this and super operator, method overriding, use of final, packages, abstract class, interface.

Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes.

Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.

**Polymorphism**: Method overloading, constructor overloading.

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**UNIT – III**

**Exception Handling:** Exception Class, built in checked and unchecked exceptions, user defined exceptions, use of try, catch, throw, throws, finally.

**Multi threaded programming:** Overview, comparison with multiprocessing, Thread class and runnable interface, life cycle, creation of single and multiple threads, thread priorities, overview of Synchronization.

**Java Library:** String handling (only main functions). Elementary concepts of Input/Output: byte and character streams, System.in and Sysem.out, print and println, reading from a file and writing in a file.

**UNIT – IV**

**Software Development using Java:**

**Applets: Introduction**, Life cycle, creation and implementation.

AWT controls: Button, Label, Text Field, Text Area, Choice lists, list, scrollbars, check boxes, Layout managers.

Elementary concepts of Event Handling: Delegation Event Model, Event classes and listeners, Adapter classes, Inner classes.

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**UNIT – V**

**JDBC:** JDBC Architecture, JDBC Drivers, Connecting to the Database

**Introduction to Java Servlets:** Life cycle, Interfaces and classes in javax.servlet package(only description) Creating a simple servlet.

**Suggested Readings:**

1. Patrick Naughton and HerbertzSchildt, "Java-2: The Complete Reference", TMH, 5theditio, 2002.
2. Bill Venners, "Inside Java Virtual Machine", TMH, 2nd edition.
3. Rick Darnell, "HTML 4 unleashed", Techmedia Publication, 2000
4. Shelley Powers, "Dynamic Web Publishing", 2nd edition, Techmedia, 1998.
5. Paul Dietel and Harvey Deitel, "Java How to Program", PHI, 8th edition, 2010.
6. E. Balagurusamy, "Programming with Java: A Primer", TMH, 1998.
7. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
8. Decker and Hirshfield, "Programming Java: A Introduction to Programming Using JAVA", Vikas Publication, 2000.
9. N.P. Gopalan and J. Akilandeswari, "Web Technology- A Developer's Perspective", PHI, 2nd edition
10. Eric Jendrock, Jennifer Ball,Debbei Carson, "The Java EE5 Tutorial", Pearson, 3rd edition, 2007.
11. Daniel Liang, "Introduction to Java Programming", Pearson, 7th edition, 2010.

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**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 for sorting a given list of names in ascending order.
4. 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).
5. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
6. Write a Java program that displays the number of characters, lines and words in a text file.
7. Write a Java program for creating multiple threads
   a) Using Thread class.
   b) Using Runnable interface.
8. Write a Java program that illustrates how run time polymorphism is achieved.
9. Write a java program that illustrates the following
   a) Creation of simple package.
   b) Accessing a package.
   c) Implementing interfaces.
10. Write a java program that illustrates the following
    a) Handling predefined exceptions.
    b) Handling user defined exceptions.

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11. APPLETS
    a) Working with Frames and various controls.
    b) Working with Dialogs and Menus.
    c) Working with Panel and Layout.
    d) Incorporating Graphics.
    e) Working with colours and fonts.
12. SWINGS
    Jpanel- Jframe – Jtoolbar—JwindowFramework

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

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**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.

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| | | | | | | | THEORY | | | PRACTICAL | |
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| MCA205 | AEC | Artificial Intelligence and Machine Learning | 3 | 0 | 0 | 3 | 60 | 20 | 20 | 0 | 0 |

- 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.
- 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.

# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Shri Vaishnav Institute of Computer Applications

### Name of the Program: M.Sc. in Computer Science

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

**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.

**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.