School of Computer Science & IT
Devi Ahilya Vishwavidyalaya

SYLLABUS

M.Sc (Information Technology) 2 years

Program Educational Objectives (PEOs)

PEO 1: Demonstrate advanced technical proficiency and specialized IT skills to analyse, design, and implement innovative IT solutions for real-world problems.

PEO 2: Engage in innovation and contribute to the development of technology solutions that address current societal issues, emphasizing sustainability and ethical considerations.

PEO 3: Excel in diverse professional environments, demonstrating strong technical knowledge, team collaboration, communication, and leadership skills in evolving IT landscapes.

Program Specific Outcomes (PSOs)

PSO 1: Develop robust theoretical and practical foundation in information technology to conduct application development, research and innovation challenges in the field of networking, web technology and mobile computing.

PSO 2: Demonstrate expertise in IT solution design and development by leveraging latest tools, frameworks, and methodologies to address real-world problems.

III - SEMESTER

TAKSHASHILA CAMPUS, KHANDWA ROAD, INDORE (MP) - 452017, INDIA
For details, visit: https://scs.dauniv.ac.in/syllabus.php

CS-4211: Object Oriented Programming using JAVA

Aim:
Understanding the concepts of java programming , implement and solving queries.

Course Outcomes:

CO 1: 1.Understand basic principles of object-oriented program design using Java.
CO 2: 2.Understand the basic and some advanced issues related to writing classes and methods such as data, visibility, scope, method parameters, object references, and nested classes.
CO 3: 3.Understand the basic ideas behind class hierarchies, polymorphism, and programming to interfaces and get exposure to exception and exception handling.
CO 4: 4.Understand the concepts of multithreading, Introduction to Graphical User Interface, Swing components, Applets and to develop solid Java programming skills and the ability to put in practice the acquired Knowledge
CO 5: 5.Understand Generic and collection API , Database connectivity, New features of java understanding Java language and object-oriented design in relatively simple case studies

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Unit-I

Required No. of hours: 06

Introduction to Java: Features of Java, Object-oriented Programming Overview, Introduction of Java Technologies, Java Applets and Applications, Java Platform, Java Program structure, Basic Building Blocks (comments, character set, constants), Data Types, Variables, Operators, Expressions, Typecasting, Control Structures, Loops, Memory concepts, Introduction to Class, Objects, Methods and Instance Variables, Naming Conventions, Constructors, Method Overloading, Static Method, Static Field, Math Class, this reference, Garbage collection and finalize method.

Unit-II

Required No. of hours: 10

String Handling: The String Constructors, String Operations, Character Exaction, String Comparison, String Buffer. Arrays: Creating an array, Enhanced for Statement, Passing Multidimensional Arrays, Arrays to Method, Variable-Length Argument lists, Using Commandline Arguments. Wrapper Class: Introduction to wrapper classes. Inheritance: Relationship between Super classes and Subclasses, Using super, Constructor in Subclasses, The Object Class, Object Copying in Java. Polymorphism: Method Overriding, Upcasting, Dynamic Method Dispatch, final Field, Method and classes, Abstract classes and Methods, instance of operator, Down casting, Runtime type Identification.

Unit-III

Required No. of hours: 08

Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, Creating own Packages. Defining an Interface, Properties of Interface, Advantages of Interface Achieving Multiple Inheritance through Interfaces, Variables in Interfaces,

Comparable Interface. Exception Handling: Introduction, keywords, Types of Exceptions, Java Exception Hierarchy, finally Block, Chained Exceptions, Declaring new Exception Types.

Unit-IV

Required No. of hours: 10

Multithreading: Introduction, Java Thread Model, Thread priorities, Thread life cycle, Creating Thread, Thread Execution, Thread Synchronization, Monitor and Monitor Locks, Inter-Thread Communication. Introduction To GUI : Introduction, Overview of swing Components, Introduction to Event Handling, Applets: Applet Basics, Applet Architecture, Applet Life Cycle Methods, Applet HTML Tag and Attributes, Executing Applet in Web Browser and in Applet viewer.

Unit-V

Required No. of hours: 06

Generic and Collection API: Introduction, Motivation for Generic Methods, Generic Methods: Implementation and Compile- time Translation Issues, Overloading Generic Methods, Generic Classes, Raw Types, Generic and Inheritance Database connectivity: JDBC, The design of JDBC, Executing Queries. New Feature of Java: Java Reflection API, Auto boxing, Annotations, Regular Expressions.

Text Books:

1. Java 2: The Complete Reference by Herbert Schildt

Reference Book(s):

The Java Programming Language, Ken Arnold, James Gosling, David Holmes, 3rd Edition, Pearson Education, 2000. 2. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Publication, 2nd Edition, 2005.

CS-5613: Computer Networks

Aim:

To provide a theoretical foundation of data communication that helps the students to understand the design issues of implementing computer networks and, developing network applications.

Course Outcomes:

CO 1: Learn the basic concepts of data communication, computer networks and Internet.
CO 2: Develop the problem-solving skills required for communication between devices by understanding the design issues and services of various layers in a network architecture.
CO 3: Apply the knowledge in developing robust and secure IT applications.
CO 4: -
CO 5: -

Unit-I

Introduction: Overview, Applications of Computer Networks; Network Hardware – LAN, MAN, WAN and topologies; LAN components – File server, Workstations, Network Adapter Cards; Network Software - Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less services, Service primitives, Relationship between Services and Protocols; Switching Techniques – Circuit Switching and Packet Switching; Reference models – OSI and TCP/IP, comparison and critique of OSI and TCP/IP reference models.

Physical Layer: data communication fundamentals – Signal, bandwidth, data rate, modulation; Guided Transmission media – Twisted pair, Coaxial Cable and Fibre Optics; Wireless transmission – EM spectrum, radio transmission, Microwave transmission, Infrared transmission.

Unit-II

Data Link Layer: Design issues – Services, Framing, Error Control and Flow Control; Error Detection Techniques – Parity Check and Cyclic Redundancy Check (CRC); Error Correction Technique – Hamming code; Elementary Data Link Protocols – Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol, Sliding Window protocols:- One-Bit Sliding Window Protocol, protocol using Go Back N and Selective Repeat; HDLC protocol; Data link layer in the Internet – PPP.

Unit-III

Medium Access Sublayer: Channel Allocation problem; Multiple access protocols: Pure Aloha, Slotted Aloha, CSMA Protocols, CSMA/CD, Collision-Free Protocols, CSMA/CA; IEEE MAC Sublayer protocols - 802.2, 802.3; High speed LANs – Fast Ethernet, FDDI; Wireless LANs: IEEE 802.11, IEEE 802.16; Data Link Layer Switching – Bridges and Switches, their difference with Repeaters, Hubs, Routers and Gateways.

Unit-IV

Network Layer: Design issues; Routing algorithms - Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcasting Routing, Multicast Routing; Internetworking; The Network Layer in the Internet - Internet Protocol, Internet addressing and Internet Control protocols.

Unit-V

Transport Layer: Transport Service; Elements of transport protocols - Addressing, Connection establishment, Connection release, Flow control and Buffering, Multiplexing; The Internet Transport Protocols - UDP and TCP.

Application layer: Client Server Architecture, DNS, WWW and HTTP, E-mail Protocols (SMTP, POP3, IMAP, MIME), FTP, TELNET.

Network Security: Cryptography, Symmetric Key Algorithms, Public key Algorithms and Digital Signatures.

Text Books:

Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, Pearson Education.

Reference Book(s):

Behrouz A. Forouzan, “Data Communications and Networking”, Fourth Edition, McGraw-Hill Publication.

William Stallings, “Data and Computer Communications”, Eighth Edition, Pearson Education.

James F. Kurose & Keith W. Rose “Computer Networking : A Top Down Approach”, Fourth Edition, Pearson Education.

Douglas E. Comer, “Computer Networks and Internets”, Fourth Edition, Pearson Education.

CS-5713: Data Analytics

Aim:

This course aims to provide a solid foundation for the fundamental concepts of machine learning and its applications and prepare students for advanced research and real-time problem solving in machine learning and related fields.

Course Outcomes:

CO 1: After undergoing this program, students will get advanced knowledge in theory and applications in all areas of Data Science, Data Analytics, Statistical Learning, Machine Learning, Data Base Management, Artificial Intelligence, etc.

CO 2: Students are well equipped to undertake any work involving exploratory data analysis, fraud analytics, data learning, text mining etc. as future entrepreneurs.

CO 3: Students have developed skills in advanced computing softwares like Python for big data analytics, computing and data analysis.

CO 4: Students have secured practical skills in statistical methods and computer programming to plan and execute projects and decision making using Data Science, Data Analytics, Machine Learning etc.

CO 5: Students are motivated to pursue teaching and research in all emerging areas of research in theoretical and applied branches of Data Science, Data Analytics and related areas.

Unit-I

Introduction: What is Data Analytics?, The Data Analytics Process, Different Types of Data: Quantitative, Categorical. Graphical Summaries of Data: Pie Chart, Bar Graph, Pareto Chart, Histogram etc. Measuring the Center of Quantitative Data: Mean, Median, Mode. Measuring the Variability of Quantitative Data: Range, Standard Deviation, and Variance

Unit-II

Introduction to Data:Cleansing, Missing and Repeated Values, Feature Engineering, Outliers and Errors, Finding Outliers.Introduction to Artificial Intelligence, Machine learning and Data Science. Use of python in Data Analytics

Unit-III

Regression: Simple Linear Regression, Multiple Regression, Assessing Performance, Ridge Regression, Feature Selection & Lasso, Nearest Neighbors & Kernel Regression.

Unit-IV

Classification: Linear Classifiers & Logistic Regression, Learning Linear Classifiers, Overfitŋng & Regularization in Logistic Regression, Decision Trees, Preventing Overfitŋng in Decision Trees, Handling Missing Data, Boosting, Precision-Recall, Scaling to Huge Datasets & Online Learning

Unit-V

Clustering & Retrieval: Nearest Neighbor Search, Clustering with k-means, types of clustering methods ,Applications of clustering ,Mixture Models, Mixed Membership Modeling via Latent Dirichlet Allocation, Hierarchical Clustering

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Text Books:

Allan G. Bluman, Elementary Staϴsϴcs: A Step By Step Approach, 10 th Edition, Mc Graw-Hill, 2017 .

Tom Mitchell, Machine Learning, First Edition, McGraw Hill 1997 .

Reference Book(s):

Coursera and Edx Moocs on Data AnalyϴcsSCSIT, DAVV, Indore, MP - 452017

CS-5123: Theory of Computation

Aim:

Theory of computation aims to develop a formal mathematical model of computation that reflects the real world computers.

Course Outcomes:

CO 1: Key notions of computation, such as algorithm, computability, undecidability and complexity, through problem solving.

CO 2: The models of computation, including formal languages, grammars, automata and their connections.

CO 3: Analyze and designing finite automata, pushdown automata, Turing machines, formal languages, and grammars.

CO 4: Ability to relate practical problems to languages, automata, and computability

CO 5: Students will be able to classify formal languages into regular, context-free, context sensitive and unrestricted languages.

Unit-I

Theory of Automata: String, Alphabet and Languages, Finite Automata, Finite State machine, Basic Definition. Description of a Finite Automaton, Deterministic Finite Accepters Transition Graphs, Languages, Non-deterministic Finite Acceptors- Definition, Finite Automata with ϵ- moves, Equivalence of Deterministic and Nondeterministic Finite Accepters, Conversion of NDFA to DFA, Removal of ϵ transition from ϵ – NDFA, Minimization of Finite Automata –Definition and Construction. Mealy and Moore models Definitions, Transformation of Mealy Machine into Moore Machine and vice-versa.

Unit-II

Properties of Regular Sets: Pumping lemma for regular set, Closure properties of regular set. Formal Language: Basic Definition, Chomsky Classification of languages, Regular Expression and Connection between Regular Expressions and Regular Languages.

Unit-III

Regular Grammars – Right and Left Linear Grammars, Equivalence between Regular Languages and Regular Grammars. Context-Free Grammars: Leftmost and Rightmost Derivations, Derivation Trees, Parsing and Ambiguity, Simplification of CFGs. Chomsky Normal Form, Greibach Normal Form, Cocke-Kasami- Younger Algorithm, Properties of Context-Free Languages.

Unit-IV

Pushdown Automata: Definition, Non-deterministic Pushdown Automata, Pushdown Automata for Context Free Languages Context-Free Grammars for Pushdown Automata. Deterministic Pushdown Automata and Deterministic Context-Free Languages.

Unit-V

Turing Machine: Definition of Standard Turing Machine, Turing Machine as Language Accepters and Transducers.

Text Books:

J. E. Hopcroft, R. Motwani and J.D Ullman, Introduction to Theory, Languages and Computation; Second Edi□on, Addison-Wesley, 2001 Narosa Publishing House.

Reference Book(s):

1. Mishra and Chandrasekaran, Theory of Computer Science (Automata, language and Computation), 2nd Ed. Prentice Hall of India.
2. Peter Linz, An Introduction to Formal Languages and Automata, Narosa
3. Martin, J.C.: Introduction to Languages and the Theory.

CS-4508: Computer Graphics and Multimedia

Aim:

This course aims to combine theoretical approaches with modern techniques of computer graphics and multimedia to design graphics software systems.

Course Outcomes:

CO 1: Students will develop an understanding of how to scan and convert the basic geometrical shapes and how to transform the shapes to fit them as per the picture definition.

CO 2: Students will acquire an understanding of world coordinates, device coordinates, clipping, and 2-dimensional transformations.

CO 3: Students will learn the basics of 3-dimensional transformations in computer graphics.

CO 4: Students will learn various polygon filling algorithms and applications of these algorithms to different problems.

CO 5: Students will learn about multimedia and different colour models along with their applications

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Unit-I

Unit 1

Introduction to Computer Graphics, Application of Graphics, Display Devices:
Refresh Cathode -Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Flat Panel Displays. Video cards/display cards, Input Devices: Mouse, Trackball, Space ball, Data Glove, Joystick, Light pen, Scanner, Digital Camera, Touch Panels, Voice Systems. Hardcopy Devices: Printers and Plotters. Graphics Primitives: Line Generation Algorithms: DDA algorithm, Bresenham's algorithm, Graphics Primitives: Circle Generation Algorithms: Midpoint Circle algorithm, Bresenham's circle generation algorithm, Ellipse Generation algorithm.

Unit-II

Unit 2

Two Dimensional Transformations: Translation, Scaling, Rotation, Reflection, Shear, Homogeneous coordinate system, composite transformations, raster method of transformation Two Dimensional Viewing: Window to Viewport coordinate transformation. Clipping: Clipping operations, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky Algorithm. Polygon clipping: Sutherland- Hodgeman Algorithm.

Unit-III

Unit 3

Three Dimensional transformations: 3D Geometry, 3D display techniques, 3D translation, scaling, reflection, rotation, shearing transformations.

Unit-IV

Polygon filling Algorithms: Scan Line Polygon filling algorithm, Inside - Outside Tests, Boundary-Fill algorithm, Flood - Fill algorithm, 4-connected approach, 8-connected approach.

Unit-V

Unit 5

Colour Models and Colour Applications: Colour models: Properties of Light. Standard Primaries and the Chromaticity Diagram, RGB Colour Model, CMY Colour Model, HSV Colour Model, YIQ colour model. Advancements in the technology in Computer Graphics. Multimedia: Introduction, Multimedia applications, Multimedia data and File formats.

Text Books:

1. Donald Hearn and M. Pauline Baker, Computer Graphics: C Version, Second Edition, Prentice Hall of India.
2. Tay Vaughan, Multimedia: Making it Works, Seventh Edition, Tata McGraw-Hill Professional, New Delhi.

Reference Book(s):

1. David F. Rogers, Procedural Elements for Computer Graphics, Tata Mc-Graw-Hill Publishing Company Ltd.,New Delhi, 2001.
2. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics: Principles and Practice in C, Second Edition