

Subject Name	L	T	P	Credit
Advanced Java Programming	2	1	2	4

Objectives:

This course develops programming ability of students to create dynamic web applications using server side technology with Java Database Connectivity. Students can learn networking and remote method invocation using Java API. Different Java frameworks like Struts will increase ability of students in web application development.

Unit-1

Introduction to Swing, Applications and Pluggable Look and Feel, Swing Components: Image Icon, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JList, JProgressBar, Using Menu & Toolbar, Different Panes, JPanel, JTable, JSlider, JInternalFrame, Dialog Boxes. Event Handling. Multithreaded applications with Applets and Swings.

Introduction to J2EE, , Web Application Structure, Web Architecture Models. Multi Tier Enterprise applications, Web containers and Application servers. Explore Java EE Containers, Types of Servers in J2EE Application.

Unit-2

Advance Networking

Networking Basics, Introduction of Socket, Types of Socket, Socket API, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection. RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization. Client Server Application using RMI

Unit -3

JDBC Programming

JDBC Architecture, Types of JDBC Drivers, Introduction to major JDBC Classes and Interface, Creating simple JDBC Application, Types of Statement (Statement Interface, PreparedStatement, CallableStatement), Exploring ResultSet Operations, Batch Updates in JDBC, Creating CRUD Application, Using Rowsets Objects, Managing Database Transaction. Multithreaded client server application with Swing and JDBC.

Introduction to Beans: Java Bean API, Beans properties, Simple Bean Example, Enterprise Java Bean-Entity Beans, Session Beans, Message Driven Beans.

Unit -4

Servlet API and Overview

Servlet Introduction, Server side programming with Java Servlet, Servlet Life Cycle, Servlet Configuration with Deployment Descriptor, Working with ServletContext and ServletConfig Object, Response and Redirection using Request Dispatcher and using sendRedirect Method, Filter API, Manipulating Responses using Filter API, Writing simple filter application Session Tracking: using Cookies, HttpSession, Hidden Form Fields and URL Rewriting, Types of Servlet Event: ContextLevel and SessionLevel.

Unit-5

Java Server Pages

Introduction to JSP , Comparison with Servlet, JSP Architecture, JSP Life Cycle, JSP Scripting Elements, JSP Directives, JSP Action, JSP Implicit Objects, JSP Expression Language, JSP Standard Tag Libraries, , overview of XML Tag library, SQL Tag library

and Functions Tag library JSP Custom Tag, JSP Session Management, JSP Exception Handling, JSP CRUD Application. **Java XML library - JAXP, XML Parsing - DOM, SAX, Java Web Services – RESTful Web Services, SOAP Web Services.**

Java Web Frameworks

Basics of MVC, MVC Type1 and Type2 architecture, Struts & Spring framework, components of Model, Views and Controller in Struts Framework, Interceptors, Struts 2 validation, Custom validation, Bundled validation, Ajax validation. Introduction to Hibernate, **Hibernate framework and Architecture.**

Outcomes:

- Gain the knowledge of J2EE architecture, MVC Architecture. (Knowledge)
- Summarize Multi -tier Application, Various Network Protocol.
- Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization, naming services and JNDI. (Knowledge, Comprehension)
- Gain the knowledge of Server Side programming by implementing Servlet and JSP. Understand and write the deployment descriptor and enterprise application deployment. (Knowledge, Application)
- Design and implement components like: Session, Java Beans, JSTL, Tag
- Design and Develop various application by Integrating any of Servlets, JSPs, Swing and Applet using Database, RMI & Struts by analyzing requirements and evaluating existing system.

Text books:

1. Complete Reference J2EE by James Keogh McGraw publication
2. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest, Wiley Publication.

Reference books:

1. SCWCD, Matthew Scarpino, Hanumant Deshmukh, Jignesh Malavie, Manning publication
2. JDBC™ API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
3. Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
4. Advanced Java Technology, By M.T. Savaliya, Dreamtech

List of Practicals:

1. Write a Java program using swing that works as a simple calculator.
2. Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
3. Write a Java program for one way TCP communication for server and client, where server will response to client with current data and time.
4. Write a Java program for two way TCP communication for server and client. It should work like a simple chat application.
5. Design an RMI application to demonstrate BANK ATM Machine transactions.
6. Write a JDBC application which will interact with Database and perform the following task.
 - 1) Create Student Table with RollNo, Name, and Address field and insert few records.
 - 2) Using Statement Object display the content of Record.
 - 3) Using Statement Object Insert Two Record.
 - 4) Using Statement Object Update One Record.
 - 5) Using Statement Object Delete One Record.
 - 6) Using Statement Object display the content of Record.

7. Study, Installation and Configuration of Apache Tomcat, Glassfish and other Applications Servers and Eclipse/Netbeans IDE.
8. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else a message "login failed".
9. Create Servlet that uses cookies to store the number of times a user has visited the servlet.
10. Create login form and perform state management using Cookies, HttpSession and URL Rewriting.
11. Create a JSP Module to demonstrate Login to a website with user credentials.
12. Create a custom JSP tag that prints current date and time. Use this tag into JSP page.
13. Create JSP Application to demonstrate a web shopping cart.
14. Create an application using MVC Architecture, JDBC and Web Services.

Subject Name	L	T	P	Credit
Computer Graphics and Multimedia	2	1	2	4

Objectives:

To introduce the concepts and techniques used in Computer Graphics ,Animations & Multimedia. To make the students understand graphics programming & To perform visual computations for geometrical drawings. To perform image manipulation, enhancement, create animations, create a multimedia presentation/Game/Project

Unit-1

Introduction: Basics, applications and scope, graphics standards, Interaction (sample-and event-driven) and Graphics User Interface (GUI) features.

Introduction to Raster Scan displays, Flat Panel Displays, Pixels, Frame buffer, Vector & Character generation, Random Scan systems, Display devices, Scan Conversion techniques,

Line Drawing: Simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms: Midpoint Circle drawing and Bresenham's Algorithm, Polygon fill algorithm: Boundary-fill and Flood-fill algorithms

Unit-2

Two-Dimensional Transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogenous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping & Polygon Clipping Algorithms

Unit -3

Three-Dimensional Concepts and Object Representation:- Three Dimensional Display Methods, Polygon Surfaces, Curved Lines & Surfaces, Translation, Rotation and Scaling. Parallel & Perspective Projection:

Types of Parallel & Perspective Projection, Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm. Curve generation, Bezier and B-spline methods. Basic Illumination Model: Diffuse reflection, Specular reflection, Phong Shading, Gouraud shading, Ray Tracing, Color models like RGB, YIQ, CMY, HSV.

Unit -4

Multimedia System: An Introduction, Multimedia hardware, Multimedia system architecture. Data and file format standards, Multimedia I/O technologies- Audio-Components of an audio system, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software digital voice and audio, Video-Video color spaces, Digital Video, Digital Video processing, Video file formats video image and animation, full motion video, storage and retrieval technologies.

Unit-5

Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation softwares. Compression: Lossless/Lossy Compression techniques, Image, Audio & Video Compressions, MPEG Standards

Multimedia databases, Multimedia authoring, Hypermedia, Integrated multimedia message standards, Integrated document management, distributed multimedia systems.

Outcomes:

- Students will demonstrate and understanding of graphic systems, the fundamental techniques in graphics development, and standard graphical algorithms.

- Students will describe and discuss human-computer interaction principles as they relate to computer graphics.
- Students will design and create effective graphical user-interfaces.
- Students will develop computer animation sequences.
- Students will be proficient in the use of multimedia techniques.

Text books:

1. D. Hearn & M.P. Baker - Computer Graphics, 2/e , Pearson Education, New Delhi, 2005
2. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill

Reference books:

1. Mathematical elements for Computer Graphics; 2nd edn.; D. F. Rogers and J. A. Adams; McGraw-Hill International. Edn., 1990.
2. 3. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Maurya, "Computer Graphics with Virtual Reality System " , Wiley India
4. Pakhira, "Computer Graphics ,Multimedia & Animation", PHI learning
5. Andleigh, Thakral , "Multimedia System Design " PHI Learning

List of Practicals:

1. Write a program to draw a rectangle using line function
2. Write a program to draw a line using DDA's line drawing algorithm
3. Write a program to draw a line using Bresenham's line drawing algorithm
4. Write a program to draw a circle using equation of circle .
5. Write a program to draw a circle using Bresenham's circle drawing algorithm
6. Write a program to draw a circle using mid point circle drawing algorithm
7. Write a program to draw a circle using polar co-ordinates
8. Write a program to fill a circle using Boundary Fill Algorithm
9. Write a program to fill a circle using Flood Fill Algorithm
10. Write a program for line clipping using cohen Sutherland algorithm
11. Write a program to translate a triangle about the origin
12. Write a program to scale a triangle about a fixed point taken as one of the vertex of the triangle
13. Write a program to rotate a triangle about a fixed point taken as one of the vertex of the triangle

Subject Name	L	T	P	Credit
Data Analytics and Applications	3	0	0	3

Objectives:

This course will cover fundamental techniques used in Data Analytics. The statistical foundations will be covered first, followed by various methods and techniques of basic data analytics. Technological aspects like data management (Hadoop) and visualization will also be covered. In summary, this course will provide exposure to theory as well as various basic and advanced data analytics methods and techniques with implementation methodology. Introduce students the concept and challenge of big data (3 V's: volume, velocity, and variety). Teach students in applying skills and tools to manage and analyze the big data.

Unit-1

Overview of Data analytics: Definition, foundations data analytics, mathematics and data analytics, analysis and analytics, The basics of data analytics: Planning a study, survey experiments, gathering data, select a useful sample, exploring data, descriptive analysis, charts and graphs. Measuring central tendency: Mean median, mode, variance, standard deviation, coefficient of variation. Charts and graphs: pie charts, bar graphs, time charts, line graphs Histograms, scattered plots.

Unit-2

Basic Data Analytics: Methods and Techniques

Exploratory Data Analysis: Visualization, Dirty Data, Visualizing a single data, examining multiple variables, Data exploration verses presentation.

Statistical Methods for evaluation: Hypothesis Testing, Difference Mean, Wilcoxon-Rank sum test, Type-I and Type-II errors, Power and sample size, ANOVA

Analytical Technique: Algorithm versus Analytical Model, Forecasting, Descriptive analytics, predictive analytics, Decision Optimization.

Unit -3

Advanced analytical theories and Methods

Clustering: overview, k-means;

Associative Rules: Overview, Apriori algorithm, evaluation of candidate rules, application of associative rules.

Regression: Linear Regression, logistic regression, regression Models,

Classification: Decision trees, Native Bayes, other classification methods.

Time Series analysis: overview, ARIMA model;

Text Analysis;

Unit -4

Analytics Implementation Methodology

Centralized Vs Decentralized, Centralized approached, Decentralized approach, Hybrid approach; Data analytics life cycle: life cycle overview, Discovery, Data preparation, model planning, model building, communicate results, communicate results, operationalization.

Unit-5

Using Analytics & Implementation

Health care, CRM (Customer relationship Management), Human Resource , Insurance, Pattern and problems.

Big Data: Velocity Variety, Volume; Big data implementation challenge; Hadoop: Hadoop Technology stack, Hadoop solution architecture , Hadoop as an analytical engine; Cloud computing (for analytics): Disintegration in cloud computing, analysis in cloud computing.

Outcomes:

The students will be able:

- To demonstrate data analysis/statistical analysis
- To effectively visualize the data.
- To understand the business data analytics through the various basic and advanced methods and techniques.
- To demonstrate the ability to use technical skills in predictive and prescriptive modeling to support business decision-making.
- To demonstrate the ability to translate data into clear, actionable insights.
- To demonstrate effective communication skills that facilitates the effective presentation of analysis results.
- Broad understanding of Data analytics application and approaches used. Good preparation for any student likely to be involved with Data Analytics in their future.

Text books & Reference books:

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education services, John Wiley & Sons.
2. Data Analytics for Beginners: Basic Guide to Master Data Analytics by Paul Kinley.
3. Implementing Analytics by Nauman Sheikh, MK publications
4. Data Analytics Made Accessible by Dr. Anil Maheshwari

Subject Name	L	T	P	Credit
Data Mining and Warehousing	2	1	0	3

Objectives:

- To learn the algorithms used for various types of Data Mining problems
- To understand the concept of Analytical Processing (OLAP).
- To understand the need for Data Mining.
- To Learn Data Warehouse Technologies and conceptualize the architecture of a Data Warehouse.

Unit-1

Introduction to Data Warehousing: need of Data Warehouse, The modern Data warehouse, Data Warehouse roles and structure, Data Warehouse Design Methodology, The cost of Warehousing Data, Data Marts and Start Schema Design, Data Extraction, Cleanup and Transformation Tools, Metadata, Metadata Extraction, Fundamentals of ETL Architecture.

Unit-2

Data Warehouse and OLAP technology. Reporting and Query tools and Applications. Multidimensional data models and different OLAP Operations, OLAP Server: ROLAP, MOLAP, Data Warehouse implementation ,Efficient Computation of Data Cubes, Processing of OLAP queries, Indexing data.

Unit -3

Foundation of Data mining, Importance of Data Mining, Applications of Data Mining, The roots of Data Mining Data Pre-processing & Data Mining primitives, , Data cleaning, Data Integration and Transformation, Data reduction, Discretization and Concept Hierarchy Generation. KDP (Knowledge Discovery Process), , Introduction of Web Structure Mining, Web Usage Mining, Spatial Mining, Text Mining. Concept Description: characterization and Comparison, Analytical Characterization, Mining Class Comparison. Security Issue, Privacy Issue, Ethical Issue.in Data Mining, , Social impacts of Data mining.

Unit -4

Association Rules & Mining, Association Rule Mining, Mining of Single dimensional Boolean association rules, Multilevel association rules and Multidimensional association rules, Correlation analysis, Constraint based association Mining. Apriori Algorithm, FpGrowth Algorithm, Time series mining association rules, latest trends in association rules mining.

Unit-5

Basic issues regarding classification and predication, Classification by Decision Tree, Nearest Neighbor Classifiers Bayesian classification, classification by back propagation, Associative classification, Prediction,. classifier accuracy.

Cluster Analysis, basic issues, clustering using partitioning methods, Hierarchical methods, Density based methods, Grid based methods and model based methods, Algorithms for outlier analysis.

Outcomes:

- Will be enabled to learn basics of Data Warehouse fundamentals and will be able to differentiate Database Management (DBMS) and large size data warehousing methods and their needs in business systems.

- Learn various Data mining search techniques and need of Data mart over DBMS , database and Data warehouse. Student will also learn various OLAP technology will make student capable of handling huge information. Will be enabled to learn Data mining tools such as XML Miner and Weka and Data Mining algorithms

Text books:

1. Data Mining concepts and Techniques by Jiawei Han, Micheline Kamber –Elsevier.
2. Modern Data Warehousing, Data Mining and Visualization by George M. Marakas – Pearson.

Reference books:

3. Data Mining by Arun K. Pujari – University Press.
4. Data Mining by Vikram Puri And P. RadhaKrishana –Oxford Press.
5. Data Warehousing by Reema Theraja –Oxford Press

Mandsaur University

Scheme of Examination

Department of Computer Science and Engineering

Bachelor of Technology (Computer Science & Engineering)

Semester V

S. No.	Subject Code	Subject Name	Maximum Marks Allotted						Hours/Week				
			Theory			Practical			L	T	P	Credits	Total Marks
			End Sem Test (EST)	Mid Sem Test (MST)	Continuous Evaluation	End sem	Mid Sem	Continuous Evaluation					
1	CSE250	Principle of Programming Languages	60	30	10	-	-	-	3	-	-	3	100
2	CSE260	Computer Graphics and Multimedia	40	20	10	30	-	-	2	1	2	4	100
3	CSE270	Advanced Java Programming (RMI, and JSP Server Side)	40	20	10	30	-	-	2	1	2	4	100
4	CSE280	Operating Systems	40	20	10	30	-	-	2	1	2	4	100
5	CSE290	Elective -V	60	30	10	-	-	-	3	-	-	3	100
6	CSE300	Linux Laboratory	-	-	-	50	-	50	2	-	4	4	100
Total									14	3	10	22	600
	Elective -V												
	CSE291	Data Warehousing & Mining											
	CSE292	Internet of Things											
	CSE293	Data Analytics and Applications											

Signature of HOD

Dean (Academics)

Controller Examinations

Vice Chancellor

Subject Name	L	T	P	Credit
Operating Systems	2	1	2	4

Objectives:

- To have an overview of different types of operating systems.
- To know the components of an operating system.
- To understand process management, I/O management, memory management including virtual memory, protection and security management
- To have a thorough knowledge of storage management

Unit-1

Introduction: Operating System and its Classification - Batch, Interactive, Multiprogramming, Time sharing, Real Time System, Multiprocessor Systems, Multithreaded Systems, Evolution of Operating System (mainframe, desktop, multiprocessor, Distributed, Network Operating System, Clustered & Handheld System), System Protection, System Calls, Reentrant Kernels, Operating System Structure - Layered structure, Monolithic and Microkernel Systems, Operating system structure Operating System Components, Operating System Functions and Services., System Call & System Boots, Operating system design & Implementations.

Unit-2

File management: File concept, types and structures, directory structure, File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, access methods and matrices, file security, user authentication, File System Implementation Efficiency and Performance. File system in Linux & Windows

Device Management : Disk & Drum Scheduling algorithms and policies, Disk Management, Swap-Space Management. I/O devices organization, I/O devices organization, I/O buffering, I/O Hardware, Kernel I/O subsystem, Transforming I/O request to hardware operations. Device drivers, Path managements, Sub module, Procedure, Scheduler, Handler, Interrupt Service Routine.

Unit -3

Processes: Process Concept, Process States, Process State Transition Diagram, Process Control Block (PCB), Process Scheduling Concepts, CPU Scheduling Concepts, Performance Criteria, Scheduling Algorithms, Multiprocessor Scheduling. Threads and their management.

Process Synchronization: Principle of Concurrency, Producer / Consumer Problem, Inter Process Communication models and Schemes, Critical Section Problem, semaphores, classical problems of synchronization. Synchronization Hardware. Dining Philosopher Problem, Readers Writers Problem. **Process Management in Linux.**

Deadlock: System model, Deadlock characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, Recovery from deadlock, Combined Approach.

Unit -4

Memory Management :

Memory Hierarchy, Concepts of memory management, MFT & MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation. Structure & implementation of Page table. Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, Locality of reference. demand segmentation.

Unit-5

Protection: System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

Distributed operating system:- Types, Design issues, File system, Remote file access, RPC, RMI, Distributed Shared Memory(DSM), Basic Concept of Parallel Processing & Concurrent. Case study of Unix, Linux & Windows,

Outcomes:

- Design various Scheduling algorithms.
- Understanding of Design and implementation of operating systems
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.

Text books:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

Reference books:

3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
4. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education" 1996.
5. D M Dhamdhare, "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw Hill Education, 2007

List of Practicals:

1. Basics of UNIX commands.
2. Implement the following CPU scheduling algorithms.
3. a) Round Robin b) SJF c) FCFS d) Priority.
4. Implement all file allocation strategies.
5. a) Sequential b) Indexed c) Linked
6. Implement Semaphores.
7. Implement all File Organization Techniques
8. a) Single level directory b) Two level c) Hierarchical d) DAG
9. Implement Bankers Algorithm for Dead Lock Avoidance.
10. Implement an Algorithm for Dead Lock Detection.
11. Implement all page replacement algorithms a) FIFO b) LRU c) LFU
12. Implement Shared memory and IPC.
13. Implement Paging Technique of memory management.
14. Implement Threading & Synchronization Applications.

Subject Name	L	T	P	Credit
Principle of Programming Languages	3	-	-	3

Objectives:

To understand and describe syntax and semantics of programming languages. To understand data, data types, and basic statements. To understand call-return architecture and ways of implementing them. To understand object-orientation, concurrency, and event handling in programming languages. To develop programs in non-procedural programming paradigms.

Unit-1

Introduction: Reasons for studying, Concepts of Programming Languages, Programming domains, Language Evaluation Criteria, Influences on Language Design, Language categories, Programming Paradigms, Imperative, Object Oriented, Functional Programming, Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, Programming Environments.

Unit-2

Syntax and Semantics: General Problem of describing syntax and semantics, Formal method of describing syntax - BNF, EBNF for common Programming Languages features.

Data types: Introduction, Primitive, Character, User defined, Array, Associative, Record, Union, Pointer and reference types, Design and Implementation uses related to these types. Names, Variables, Concept of binding, Type Checking, Strong Typing, Type Compatibility, Named constants, Variable initialization.

Unit -3

Subprograms and Implementations: Subprograms, Design Issues, Local referencing, Parameter passing overloaded methods, Generic methods, Design issues for functions, semantics of call and return, Implementing simple subprograms, Stack and Dynamic local variables, Nested subprograms, Blocks, Dynamic scoping.

Unit -4

Object-Orientation, Concurrency: Object-orientation, Design issues for OOP languages, Implementation of object-oriented, Constructs concurrency, Semaphores, Monitors, Message passing, Threads, Statement level concurrency, Exception handling in Ada, C++ and Java.

Abstract Data types: Abstractions and encapsulation, Introductions to Data abstraction, Design issues, language examples, C++ parameterized ADT, Object Oriented Programming in Small talk, C++, Java, C#, Ada

Unit-5

Functional and Logic Programming Languages

Logic Programming Languages: Introduction and overview of Logic Programming, Basic elements of Prolog, Application of Logic Programming.

Functional Programming Languages: Introduction, Fundamentals of FPL, LISP, ML, Haskell, Application of Functional Programming Languages and comparison of Functional and Imperative Languages.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python- Values and Types, Variables, Storage and Control.

Outcomes:

- Ability to express syntax and semantics in formal notation.
- Ability to apply suitable programming paradigm for the application.
- Gain knowledge and comparison of the features programming languages.

Text books:

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.

Reference books:

1. Programming Languages, 2nd Edition, A. B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Loudon, 2nd Edition, Thomson, 2003.
3. LISP Patric Henry Winston and Paul Horn Pearson Education.
4. Programming in Prolog, W. F. Clocksin & C. S. Mellish, 5th Edition, Springer.
5. Programming Python, M. Lutz, 3rd Edition, O'reilly, SPD, rp-2007.
6. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.