23CS21T2 - OBJECT-ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, CSE (DS), CSE (AI&ML), AI&DS, and IT)

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisite:	Basic Programming Skills and Problem Solving Skills	**Sessional Evaluation:** 30 **Univ. Exam Evaluation:** 70 **Total Marks:** 100	
Objectives:	• To identify Java language components and how they work together in applications • To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, and using class libraries. • Learning to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications • Understanding to design applications with threads in Java • To understand how to use Java APIs for program development.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (L4)
	CO2	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects (L4)
	CO3	Demonstrate an understanding of inheritance hierarchies and polymorphic behavior, including method overriding and dynamic method dispatch. (L3)
	CO4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (L3)
	CO5	Perform string operations in Java, implement multithreaded programming, and graphical user interface (GUI) programming using JavaFX. (L3)
Course Content	**UNIT-I** **Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. **Data Types, Variables, and Operators:** Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final. **Introduction to Operators:** Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (--) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators. **Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.	

UNIT-II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT-III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT-IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT-V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication-Suspending, Resuming, and Stopping of Threads.

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

	TEXT BOOKS:
Text Books & References Books	1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford. 2. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023. 3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4thEdition, Pearson. **REFERENCE BOOKS:** 1. The complete Reference Java, 11thedition, Herbert Schildt,TMH 2. Introduction to Java programming, 7thEdition, Y Daniel Liang, Pearson
E-Resources	1. https://nptel.ac.in/courses/106/105/106105191/ 2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347 shared/overview