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CORE JAVA

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Core Java / Java Programming Language / JSE
[Duration: 41 Hours]

Prerequisite: C & C++ / Any OOP Programming Language

Course Contents (Chapters)

PHASE-1
1. Introduction to Java Technology
2. Introduction to Java Programming
3. Datatypes & Operators
4. Control Structures, Arrays, Strings &Wrapper Classes
5. Interfaces
6. Exception Handling
7. File Handling / (Input / Output) in Java
8. Multithreading
9. Collections Framework

PHASE-II
10. Java7 – Features – Examples
11. Java8 – Functional Programming/ Lambda Expressions & Streams
12. Java9 – Modules (JPMS)
13. Java 10, 11 & 12 Features – Examples
14. Java14 and Java 17 Features – Examples
15. Networking / Socket Programming
16. Miscellaneous topics
17. GUI Programming using Swings

Module 01: Introduction to Java Technology

o Java Editions

o How much popular is Java Programming Language

o What makes Java so special

o Platform Independent Feature

o What is Java, What is Java actually

o S/W required

o Java IDEs

o Popular s/w developed using Java

o Key Features of Java

o First Java Program & Setting Path (temporary, permanent)

o Phases from Coding to Execution in a Java Program

o Topics removed from C, C++

o How to use Eclipse IDE & some of its popular features

Module 02: Introduction to Java Programming

o Concatenation operator

o Robust feature – demo

o Creating an object

o Reading an integer, Scanner object

o Sum of two integers

o Dealing with multiple classes

o Dealing with fields/instance variables, setter method, String class

o private fields, getter methods

o Constructors examples

o What if a field is not initialized

o Visibility modifiers

o Function call mechanisms in Java

o this reference

o Comparing objects

o Garbage collection

o Printing the IDs of objects

o Another use of this reference

o static fields

o Predefined static methods

o static import

o User defined static methods

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o **extends keyword**

o **Method overriding & usage of super keyword**

o **Demo on some rules regarding function overriding**

o **Invoking base class constructors**

o **final class, final methods & final fields**

o **Upcasting, downcasting**

o **Multiple inheritance in Java**

o **Creating our own Package/Library/JAR and using it - using Eclipse IDE**

o **Assignment1: Calculate area of a circle**

o **Assignment2: Calculate simple interest**

o **Assignment3: Both usages of super keyword**

Module 03: Datatypes & Operators

o **Classification of datatypes**

o **Loss of precision error**

o **Typecasting**

o **boolean example**

o **Modulus operator unlike in C**

o **Relational operator unlike in C**

o **Boolean logical operator unlike in C**

o **Inconvertible types**

o **Default values for fields**

o **Concatenation operator revisited**

Module 04: Control Structures, Arrays, Strings & Wrapper Classes

o **Control structures classification**

o **Using \t**

o **Infinite loop unlike in C**

o **break, continue**

o **Labeled break, labeled break – nameless block, improper use of labeled break**

o **Labeled continue**

o **Arrays – declaration & definition – diff. methods**

o **Accessing array elements**

o **Robust feature – Array index out of bounds**

o **length property**

o Assigning arrays

o Enhanced for loop/ for each for loop/ advanced for loop

o 2-D array declaration

o Matrix program

o Creating array of objects

o Strings introduction, String class methods

o Comparing using equals()

o compareTo()

o StringTokenizer

o Command line arguments

o String Vs StringBuffer

o StringBuffer methods

o Wrapper classes – intro

o Boxing, unboxing

o Autoboxing, autounboxing

o Converting String to integer

o Converting integer to String

o Assignment1: Sum of all digits of a given number

o Assignment2: Print all prime numbers in a given range

o Assignment3: Enter a person's name and display only the last word completely

o Assignment4: Get the numeric part in a given string

o Assignment5: Calculate Power Bill

o Assignment6: Print Results sheet from the student's marks in an array

Module 05: Interfaces

o Every method is a virtual method-proof

o What is an interface

o Creating an interface and implementing it

o Demo on Runtime Polymorphism

o Multiple inheritance – through interfaces

o Few points on Interfaces

o Why multiple inheritance is OK with interfaces

o A class can impl. any no. of interf. & at the same time extend a class

o abstract class, abstract methods

o Assignment1: Runtime Polymorphism on Animals – eating task

o Assignment2: Runtime Polymorphism on Printers

Module 06: Exception Handling

o What is an exception

o What is exception handling

o Examples of exceptions

o keywords used

o What should be done when an error occurs

o Example without using exception handling

o using exception handling (ArithmeticException)

o NumberFormatException(with/withour)

o Multiple catch blocks

o Nested try/catch

o finally clause

o throw – introduction

o Throwing a predefined exception class object

o Throwing a userdefined exception class object

o throws clause introduction

o Stack example

o Demo on printStackTrace()

o Exceptions & Error

o Checked exceptions and unchecked exceptions

o Assignment1 – Bank Transactions

Module 07: Input / Output in Java

o Introduction

o Getting the list of filenames and subdirectory names in a directory

o FileInputStream, FileOutputStream

o FileReader, FileWriter

o BufferedReader, PrintWriter

o DataOutputStream, DataInputStream

o Printing objects directly

o Serialization/Deserialization

o Assignment1: Find whether the program is being run for the 1st time or not

o Assignment2: Writing a set of students records and reading all of them

o Assignment3: Display only non-blank lines

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Module 08: Multithreading

o Introduction

o Display current thread's name

o Another method

o Changing name of current thread

o sleep() demo

o Creating our own-threads-two ways

o Implementing Runnable interface – three varieties

o Extending Thread class

o Synchronization- introduction

o Synchronization –two varieties

o Producer-Consumer problem

o Inter-thread communication (Producer-Consumer problem solution)

o Thread Life-Cycle

o Types of Locks

o Assignment1: Update Marks and Read Marks into a shared data resource using Synchronization

o Assignment2: Railway Ticket Booking with Synchronization

Module 09: Collections Framework

o Introduction

o Hashset

o Treeset

o Arraylist

o Iterator

o Vector – four sets of functions

o Reversing & sorting a primitive collection

o Linkedlist

o Stack

o Arrays class

o Hashtable

o Treemap

o Hashmap Vs treemap Vs linkedhashmap

o Date – three varieties

o Generics

o Sorting collection of User Defined Objects

o Sorting collection of User Defined Objects – with multiple options along with the default sort

o Collections Framework Hierarchy

o Assignment1: Read phone numbers and eliminate duplicates

o Assignment2: Read cricket players' names and scores and get a particular player's score by giving his name as key

Module 10: Java7 Features – Examples

o Strings in switch Statements

o try-with-resources Statement

o Underscores in Numeric literals

o Type inference for Generic instance Creation Diamond symbol

o Improved Exception Handling - catch multiple exception types using a single catch block.

Module 11: Java8 Features

o Why Lambdas?

o Functional Programming Vs Object Oriented Programming

o Program: Without Lambda Expressions Ex1

o Program: Without Lambda Expressions Ex2 – using Polymorphism

o Program: With Lambda Expressions

o Program: Functional Interface Demo

o Program: Implementing the earlier program using Functional Interface

o Program: Lambdas Vs Interface Implementation classes

o Program: Runnable using Lambda – without using lambda – the traditional way

o Program: Runnable using Lambda – using lambda

o Program: ForEach iteration - demo

o Program: Function composition / streams – demo

o Program: Parallelism – demo

o Program: Demo on collect() static method of Collectors class – giving a List

o Program: Demo on collect() static method of Collectors class – giving a Set

o Program: Demo on collect() static method of Collectors class – giving a Map

o Program: Demo on collect() static method of Collectors class – giving a Group By Result

Module 12: Java9 – Modules (JPMS)

o Class Vs Package Vs Module

o Module Vs JAR

o Demo on Creating a Module and using it

Module 13: Java 10, 11 & 12 Features – Examples

o Program: Java 10 Feature - local variable type inference

o Program: Java 11 Feature - String class - new methods

o Program: Java 11 Feature - java.nio.file.Files Changes

o Program: Java 12 Feature - Compact formatting of numbers – Ex1

o Program: Java 12 Feature - Compact formatting of numbers – Ex2

o Program: Java 12 Feature - Files mismatch

Module 14: Java14 & Java17 Features

o Program: Text blocks

o Program: New switch syntax as statement – Ex1

o Program: New switch syntax as statement – Ex2

o Program: New switch syntax as an expression

o Program: switch with yield (to return a value)

o Program: Pattern Matching for instanceof

o Program: record

o Program: Pattern Matching for "switch"

o Program: Multi-line String

Module 15: Networking / Socket Programming

o Introduction To Networking

o Client/server program

o Chatting program

o One Server multiple clients

o Demo on using URL class

o To Print all the addresses of a given website name

o To find the hostname of local machine

o Reading from a webpage

Module 16: Miscellaneous topics

o Inner classes – four varieties
o Demo on Runtime class
o Demo on enum keyword
o Variable length argument list functions
o finalize()
o static constructor
o static import revisited
o Comparable interface
o Comparator interface
o Polymorphism with Generics
o Generic classes
o Generic methods
o Private constructor
o Queue
o Singleton Design Pattern
o Calendar class
o ListIterator demo

Module 17: GUI Programming using Swings

o Introduction to Swings
o Demo on Button click event handling
o Demo on Check Box
o Demo on Combo Box
o Demo on Table

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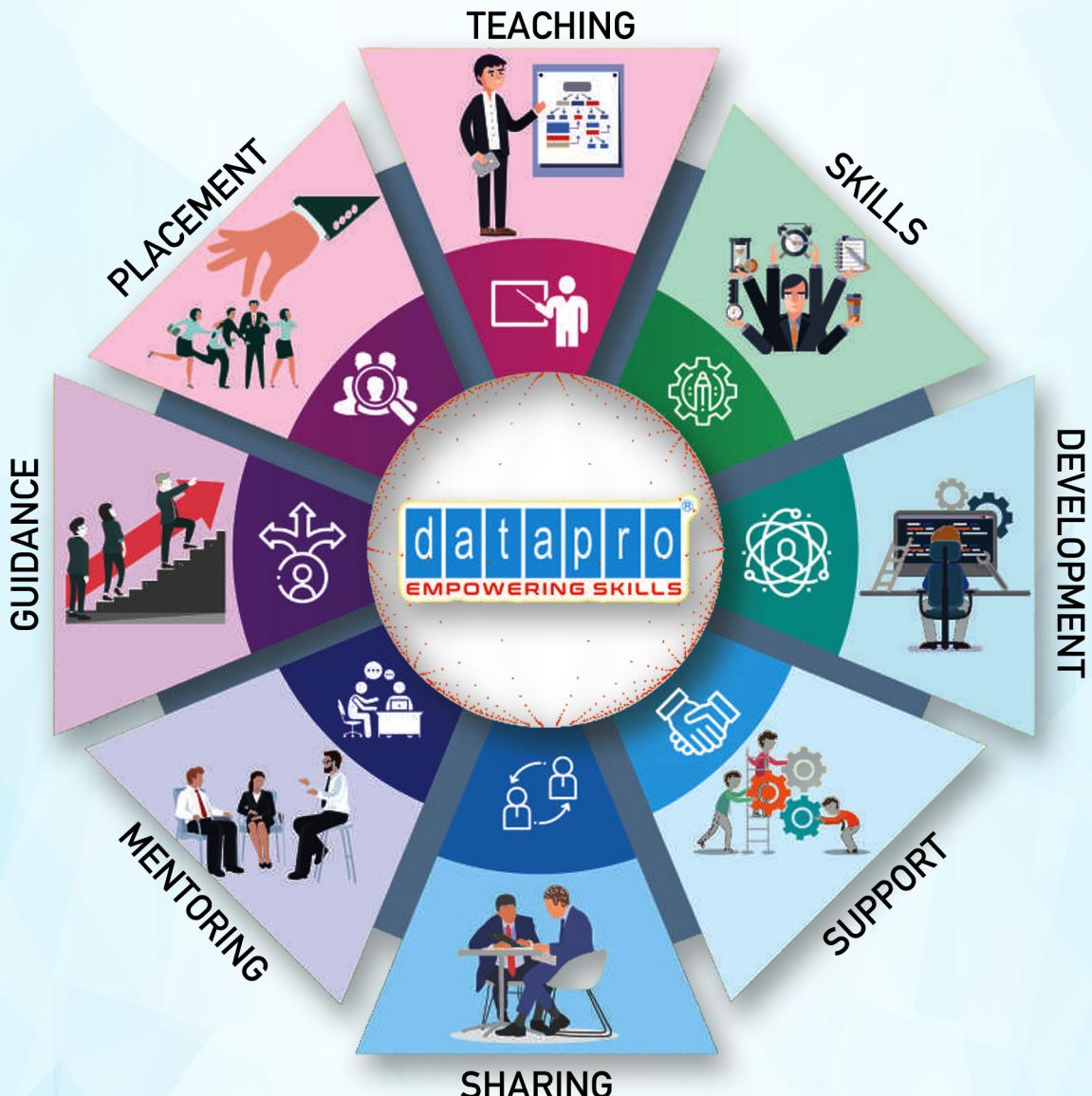
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