Programme: Diploma in Information Technology and Computer Engineering (Sandwich Pattern)													
Course Code:	**Course Title: Java Programming**												
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2:30 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
										PR	**OR**		
3	-	4	1	8	4	20	20	60	25	50#	-	25	200

Total IKS Hrs. for course:

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:
1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Java is platform independent open source object oriented programming language enriched with free and open source libraries. In current industrial scenario java has the broad industry support and is prerequisite with many allied technologies like Advanced Java, Java Server Pages, and Android Application Development. Thus current industrial trends necessitate acquiring Java knowledge for computer engineering and information technology graduates.

II. Industry / Employer Expected Outcome

This course develops necessary skills in students to apply object oriented programming techniques in Java so that students will be able to develop complete applications using core Java.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Develop programs using Object Oriented Methodology in Java.
CO2	Apply concept of Arrays and Strings.
CO3	Apply concept of Inheritance for code reusability.
CO4	Develop programs using User Defined Packages and Interfaces.

CO5	Develop programs using Multithreading and Exception Handling.
CO6	Develop programs using Lambda Expressions and Generics.
CO7	Develop programs for handling I/O, File Stream and Collections.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's	Topics / Sub-topics
1	**TLO 1.1:** Understand features of Java. **TLO 1.2**: Develop program to define class, create object and access class members. **TLO 1.3:** Understand the meaning of main() method and its attributes. **TLO 1.4:** Identify tokens and data types. **TLO 1.5:** Identify operators and evaluate expressions. **TLO 1.6:** Understand working of decision making and looping statements and develop program for the same.	**Basic Syntactical Constructs in Java** 1.1 Features of Java 1.2 Defining class, creating object, accessing class members 1.3 public static void main() method 1.4 Java tokens and data types. 1.5 Operators and expressions 1.6 Decision making and looping **Course Outcome: CO1** **Teaching Hours: 04 hrs** **Marks: 04**
2	**TLO 2.1:** Develop program to define and call constructors and methods. **TLO 2.2**: Develop program to demonstrate the use of constructor overloading and method overloading. **TLO 2.3:** Understand the use of this keyword, variable length argument, garbage collection, finalize() method. **TLO 2.4:** Identify visibility controls and its use. **TLO 2.5:** Develop program to create arrays and strings. **TLO 2.6:** Understand the use of Static modifier.	**Derived Syntactical Constructs in Java** 2.1 Constructors and Methods 2.2 Constructor overloading, method overloading 2.3 this keyword, variable length argument, garbage collection, finalize() method 2.4 Visibility controls 2.5 Arrays and strings 2.6 Static modifier **Course Outcome: CO1, CO2** **Teaching Hours: 08 hrs** **Marks: 10**

3	**TLO 3.1:** Understand and develop program for different types of inheritance. **TLO 3.2:** Understand the use of super keyword. **TLO 3.3:** Develop program to demonstrate the use of method overriding. **TLO 3.4:** Understand Dynamic method dispatch. **TLO 3.5:** Develop program to demonstrate the use of abstract methods and classes. **TLO 3.6:** Understand and develop program to define and access interface. **TLO 3.7:** Develop program to create and access user defined package.	**Inheritance, Interfaces and Packages** 3.1 Inheritance-concept, types of inheritance 3.2 Use of super keyword 3.3 Method overriding 3.4 Dynamic method dispatch 3.5 Abstract methods and classes 3.6 Interfaces 3.7 Packages-creating user defined packages, using packages **Course Outcome: CO3, CO4** **Teaching Hours: 10 hrs** **Marks: 12**
4	**TLO 4.1:** Understand, identify and develop program to handle different errors and exceptions. **TLO 4.2:** Understand and develop program to define and use user defined exceptions. **TLO 4.3:** Understand and develop program to demonstrate the use of multithreading.	**Exception handling and Multithreading** 4.1 Errors and Exceptions 4.1.1 try-catch 4.1.2 throw 4.1.3 throws 4.1.4 finally 4.2 User defined exceptions 4.3 Multithreading 4.3.1 Thread life cycle 4.3.2 Creating thread 4.3.3 Thread priority **Course Outcome: CO5** **Teaching Hours: 06 hrs** **Marks: 10**
5	**TLO 5.1:** Understand nested classes and inner classes. **TLO 5.2:** Understand default methods and functional interface. **TLO 5.3**: Understand lambda expression. **TLO 5.4:** Develop program for passing lambda expression as an argument. **TLO 5.5:** Understand generics classes and interfaces. **TLO 5.6:** Understand type parameter and type argument. **TLO 5.7:** Understand generic methods. **TLO 5.8:** Understand bounded generics.	**Lambda Expressions and Generics** 5.1 Nested classes and inner classes 5.2 Default methods and functional interfaces 5.3 Introduction to lambda expression 5.4 Passing lambda expression as an argument 5.5 Generics classes and interfaces 5.6 Type parameter, type argument 5.7 Generic methods 5.8 Bounded generics **Course Outcome: CO6** **Teaching Hours: 08 hrs** **Marks: 12**

6	**TLO 6.1:** Understand basics of I/O. **TLO 6.2:** Understand byte streams and character streams. **TLO 6.3**: Develop program for reading and writing characters. **TLO 6.4:** Develop program for reading and writing bytes. **TLO 6.5:** Understand files and directories. **TLO 6.6:** Develop program for creating files and directories. **TLO 6.7:** Understand the use of java.util.Scanner class.	**Files and I/O** 6.1 I/O basics 6.2 Byte streams and character streams 6.3 Reading/writing characters 6.4 Reading/writing bytes 6.5 Files and Directories 6.6 Creating files/directories 6.7 The java.util.Scanner class **Course Outcome: CO1, CO2** **Teaching Hours: 05 hrs** **Marks: 08**
7	**TLO 7.1:** Understand the use of Collection interface. **TLO 7.2:** Understand hierarchy of Collection framework. **TLO 7.3**: Understand and develop program to use methods of Collection interface. **TLO 7.4:** Understand the use of Collections and its interfaces.	**Collections** 7.1 Collection in Java 7.2 Hierarchy of Collection framework 7.3 Methods of Collection interface 7.4 Collections 7.4.1 Iterator interface 7.4.2 Collection interface 7.4.3 List interface 7.4.4 ArrayList 7.4.5 LinkedList 7.4.6 Vector 7.4.7 Stack 7.4.8 Queue interface 7.4.9 Set interface **Course Outcome: CO7** **Teaching Hours: 04 hrs** **Marks: 04**

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

NOTE: Total 10 experiments (or turns) out of 18 experiments (or turns)

Sr No	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO**: Able to understand and develop program based on type casting.	Develop a program for implementation of implicit type casting in Java.	2	CO1
2	**LLO**: Able to understand and develop program based on overloading.	Develop program for implementation of constructor overloading and method overloading.	4	CO1, CO2
3	**LLO**: Able to understand and develop program based on String class methods.	Develop program for implementation of different methods of String class.	4	CO1, CO2
4	**LLO**: Able to understand and develop program based on array.	Develop program for implementation of Arrays in Java.	2	CO1, CO2
5	**LLO**: Able to understand and develop program based on static modifier.	Develop program for implementation of static modifier.	2	CO1, CO2
6	**LLO**: Able to understand and develop program based on different types of inheritance.	Develop program for implementation of different types of inheritance.	4	CO3, CO4
7	**LLO**: Able to understand and develop program based on super keyword.	Develop program for implementation of use of super keyword.	2	CO3, CO4
8	**LLO**: Able to understand and develop program based on dynamic method dispatch.	Develop program for implementation of dynamic method dispatch.	2	CO3, CO4
9	**LLO**: Able to understand and develop program based on multiple inheritance.	Develop program for implementation of multiple inheritance using interface.	2	CO3, CO4
10	**LLO**: Able to understand and develop program based on user defined package.	Develop program for implementation of user defined package.	2	CO3, CO4
11	**LLO**: Able to understand and develop program based on multithreading.	Develop program for implementation of multithreading.	4	CO5
12	**LLO**: Able to understand and develop program based on exception	Develop program for implementation of exception handling.	4	CO5

	handling.			
13	**LLO**: Able to understand and develop program based on user defined exception.	Develop program for implementation of user defined exception.	2	CO5
14	**LLO**: Able to understand and develop program based on lambda expressions.	Develop program for implementation of lambda expressions in Java.	4	CO6
15	**LLO**: Able to understand and develop program based on generic interface.	Develop program for implementation of generic interfaces and methods.	6	CO6
16	**LLO**: Able to understand and develop program based on reading and writing characters and bytes.	Develop program for implementation of reading and writing characters and bytes in files.	4	CO7
17	**LLO**: Able to understand and develop program based on Scanner class.	Develop program for implementation of Scanner class.	2	CO7
18	**LLO**: Able to understand and develop program based on different Collections.	Develop program for implementation of different Collections.	8	CO7
		Total	60	

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Prepare journal of practical.
2. Undertake mini project. Develop a Java application for the requirement given by faculty.
3. Prepare a presentation on the topic given by faculty.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	**Basic Syntactical Constructs in Java**	0	2	2	4
2	**Derived Syntactical Constructs in Java**	0	4	6	10
3	**Inheritance, Interfaces and Packages**	2	4	6	12
4	**Exception handling and Multithreading**	2	4	4	10
5	**Lambda Expressions and Generics**	2	6	4	12
6	**Files and I/O**	2	2	4	8
7	**Collections**	2	0	2	4
	Total	**10**	**22**	**28**	**60**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (65 marks)

Summative Assessment (Assessment of Learning)

- End term examination, Viva-voce, Workshop performance (110 marks)

VIII. COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO 1	1	2	3	1	-	1	3	1	2	2
CO 2	1	3	3	2	-	3	3	2	2	3
CO 3	1	3	3	2	-	3	3	3	3	3
CO 4	-	3	3	2	1	3	3	3	3	3
CO 5	-	3	3	2	1	3	3	3	3	3
CO 6	3	3	3	1	-	1	3	1	2	2
CO 7	3	3	-	2	-	1	2	3	2	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr .No	Author/ Publisher	Title	ISBN
1	E. Balgurusamy	Programming with JAVA	978-9355325891
2	Herbert Schildt	Java-The complete reference 10th or later edition	978-1259589331
3	Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft	Java 8 in action, first edition	978-1617291999

X. Learning Websites & Portals

Sr.No	Link / Portal
1	https://www.javatpoint.com/java-tutorial
2	https://www.w3schools.com/java/
3	https://www.geeksforgeeks.org/java/
4	https://www.programiz.com/java-programming

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Ms. Namrata A. Wankhade	Lecturer Information Technology Department	Government Polytechnic, Mumbai
2	Sayyed Shabana Usman	Visiting Lecturer, Information Technology Department	Government Polytechnic, Mumbai
3	Varsha Khandekar	Lecturer Information Technology Department	Government Polytechnic, Thane

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal