GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Computer Applications
Level: UG
Course / Subject Code: BC03001021
Course / Subject Name : Object Oriented Programming with Java

w. e. f. Academic Year:	2025 – 2026
Semester:	3
Category of the Course:	Core Course (CC)

Prerequisite:	Knowledge of the C programming language and Object-Oriented Concept
Rationale:	The Course will equip students with the knowledge and skill to develop proficiency in creating console based applications, interpret the concepts of object oriented Programming using the Java Programming Language. Students will learn to develop an application using java.util package(Java Data Structure) ,implement multi-threaded, Student will execute the implementation of Package, Exception handling mechanism and File handling .Hands-on practice with JAVA ensures practical experience in Object Oriented paradigm

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain the fundamental concepts of object-oriented programming, such as encapsulation, abstraction, inheritance, and polymorphism, and illustrate their significance in software development.	UN
02	Construct Java programs using classes, objects, constructors, and interfaces, and demonstrate the concepts of method overloading and overriding. Compile, execute, and debug Java applications effectively.	AP
03	Develop reusable and modular Java applications by applying inheritance, polymorphism, interfaces, packages, and exception handling mechanisms.	AP
04	Implement file handling operations using Java's I/O classes and apply multithreading concepts to achieve concurrent execution.	AP
05	Design and develop solutions for real-world problems by integrating object-oriented programming principles using Java.	CR

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA/CA(M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**1. Introduction to Java** 1.1 Basics of Java, Background/History of Java, Java and the Internet, Advantages of Java 1.2 Java Virtual Machine & Byte Code 1.3 Java Environment Setup 1.4 Java Program Structure 1.5 Procedure-Oriented vs. Object-Oriented Programming concept 1.6 Basics of OOP: Abstraction, Inheritance, Encapsulation, Classes, subclasses and super classes, Polymorphism and Overloading, message communication 1.7 Compiling and running a simple "Hello World" program: Setting Up Your Computer, Writing a Program, Compiling, Interpreting and Running the program, Common Errors	4	10%
2.	2. **Building Blocks of the Language** 2.1 Primitive Data Types : Integers, Floating Point type, Characters, Booleans etc 2.2 User Defined Data Type 2.3 Identifiers & Literals 2.4 Declarations of constants & variables 2.5 Type Conversion and Casting 2.6 Scope of variables & default values of variables declared 2.7 Wrapper classes 2.8 Comment Syntax 2.9 Garbage Collection 2.10 Arrays of Primitive Data Types 2.11 Types of Arrays 2.12 Creation, concatenation and conversion of a string, changing case of string, character extraction, String Comparison, String Buffer 2.13 Different Operators: Arithmetic, Bitwise, Rational, Logical, Assignment, Conditional, Ternary, Increment and Decrement, Mathematical Functions 2.14 Decision & Control Statements: Selection Statement (if, if...else, switch), Loops (while, do-while, for), Jump statements (break, continue, return & exit)	8	20%

3.	**3. Object Oriented Programming Concepts** 3.1 Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword, 3.2 Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading	9	20%
4.	**4. Inheritance, Packages & Interfaces** 4.1 Basics of Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, subclass, dynamic method dispatch & Object class 4.2 Creating package, importing package, access rules for packages, class hiding rules in a package. 4.3 Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface 4.4 Abstract class and final class	12	25%
5.	**5. Exception Handling, Multithreaded programming and File Handling** 5.1 Types of errors, exceptions, try. Catch statement, multiple catch blocks, throw and throws keywords, finally clause, uses of exceptions, user defined exceptions 5.2 Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in threads 5.3 Stream classes, class hierarchy, useful I/O classes, creation of text file, reading and writing text files	12	25%
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**30**	**10**	**10**	**20**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Herbert Schildt,Java™: A Beginner's Guide, 7th Edition
2. E Balagurusamy, Programming with Java , Tata McGraw Hill
3. Pravin Jain, "The class of Java" Pearson Education, (2010)
4. Paul J. Deitel, Harvey M. Deitel, Java SE8 for Programmers, ISBN: 9789332539068, Pearson
5. Cay S Horstmann, Gary Cornell, "Core Java 2, Volume 1 – Fundamentals", Pearson Education (8th edition – 2008).
6. Raj Kumar Buyya, S. Thamarai Selvi, & Xing Chen Chu, "Object-Oriented Programming with Java: Essentials & Applications", Tata McGraw Hill

(b) Open source software and website:

1. https://openjdk.org/
2. https://www.oracle.com/java/technologies/downloads/
3. https://code.visualstudio.com/download
4. https://www.jetbrains.com/idea/
5. Oracle Java Documentation available for online reference at http://java.sun.com/docs/books/tutorial/index.html
6. Java SE Specifications available at https://docs.oracle.com/javase/specs/

Suggested Project List:

1	Write a program in Java to generate first n prime numbers.
2	Write a program in Java to find maximum of three numbers using conditional operator
3	Write a program in Java to find second maximum of n numbers without using arrays
4	Write a program in Java to reverse the digits of a number using while loop
5	Write a program in Java to convert number into words & print it
6	Write programs in Java to use Wrapper class of each primitive data types
7	Write a program in Java to multiply two matrix
8	Write a static block which will be executed before main ( ) method in a class.
9	Write a program in Java to demonstrate use of this keyword. Check whether this can access the private members of the class or not.
10	Write a program in Java to develop an overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing object.
12	Write a program in Java to demonstrate the use of private constructor and also write a method which will count the number of instances created using default constructor only.

13	Write a program in Java to demonstrate the use of 'final' keyword in the field declaration. How it is accessed using the objects.
14	Develop minimum 4 program based on variation in methods i.e. passing by value, passing by reference, returning values and returning objects from methods.
15	Write a program in Java to demonstrate single inheritance, multilevel inheritance and hierarchical inheritance.
16	Create a class to find out whether the given year is leap year or not. (Use inheritance for this program)
17	Write an application that illustrates how to access a hidden variable. Class A declares a static variable x. The class B extends A and declares an instance variable x. display ( ) method in B displays both of these variables.
18	Write a program in Java in which a subclass constructor invokes the constructor of the super class and instantiate the values.
19	Write a program that illustrates interface inheritance. Interface P12 inherits from both P1 and P2. Each interface declares one constant and one method. The class Q implements P12. Instantiate Q and invoke each of its methods. Each method displays one of the constants.
20	Write an application that illustrates method overriding in the same package and different packages. Also demonstrate accessibility rules in inside and outside packages.
21	Describe abstract class called Shape which has three subclasses say Triangle, Rectangle, Circle. Define one method area () in the abstract class and override this area () in these three subclasses to calculate for specific object i.e. area () of Triangle subclass should calculate area of triangle etc. Same for Rectangle and Circle
22	Write a program in Java to demonstrate implementation of multiple inheritance using interfaces.
23	Write a program in Java to demonstrate use of final class
24	Write a program in Java to develop user defined exception for 'Divide by Zero' error.
25	Write a program in Java to demonstrate multiple try block and multiple catch exception
26	Write an small application in Java to develop Banking Application in which user deposits the amount Rs 1000.00 and then start withdrawing of Rs 400.00, Rs 300.00 and it throws exception "Not Sufficient Fund" when user withdraws Rs. 500 thereafter
27	Write a program that executes two threads. One thread displays “Thread1” every 2,000 milliseconds, and the other displays “Thread2” every 4,000 milliseconds. Create the threads by extending the Thread class
28	Write a program that executes two threads. One thread will print the even numbers and the thread will print odd numbers from 1 to 50.
29	Write a program in Java to demonstrate use of synchronization of threads when multiple threads

	are trying to update common variable.
30	Write a program in Java to create, write, modify, read operations on a Text file.

CO- PO Mapping:

Semester 3	**Course Name : Object Oriented Programming with Java**										
	POs										
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	1	-	-	-	-
CO2	3	-	2	-	1	-	1	-	-	-	-
CO3	3	1	3	-	1	-	1	-	-	-	-
CO4	3	2	3	-	1	-	1	-	-	-	-
CO5	3	2	3	-	1	-	1	-	-	-	-

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

Note: The CO-PO mapping is indicative; the institute/faculty member can change as required.

* * * * * * *