GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering
Level: Diploma
Branch: Information Technology
Course / Subject Code : DI03016051
Course / Subject Name : Object Oriented Programming with JAVA

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	Basic computer skills and an understanding of coding concepts.
Rationale:	Java is a versatile, general-purpose programming language that is open-source, platform-independent, class-based, and object-oriented, featuring an extensive library ecosystem. It is widely recognized for its simplicity, portability, reliability, and is designed to be robust, secure, dynamic, and architecture-neutral. The "write once, run anywhere" principle allows Java code to run on any platform that supports Java without needing to be recompiled. With strong industry support, Java is essential for many technologies such as Java Server Pages (JSP) and Android app development. This course equips students with the essential skills needed to develop object-oriented applications in Java and will enable them to solve real-world programming challenges.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand Object-Oriented Programming paradigm with java.	Understand
02	Understand building blocks of OOPs language.	Understand
03	Implement exception handling and multithreading in object oriented programs.	Apply
04	Develop an object oriented program to handle files.	Apply

**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(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Object Oriented Programming paradigm and JAVA** 1.1 Introduction to Programming paradigm, types of programming paradigm, Procedure-Oriented vs. Object-Oriented Programming, Features of Object-Oriented Programming:- encapsulation, inheritance, polymorphism, abstraction, etc. , Benefits of OOP, Applications of OOP. 1.2 Basics of Java:- Background/History of Java, Java Features, JDK, JRE, JVM, and Byte code, Java Environment Setup, and Java program structure. 1.3 Basic Language Elements:- Comments, data types, variables, scope and lifetime of variables, operators, type conversion and casting, Control Statements: Conditional and Looping Statement, Command line argument, and Java Memory Management.	**8**	**15**
2.	**Fundamentals of Object Oriented Programming** 2.1 Objects, Classes and Methods, Passing and Returning object from Method, Method overloading. 2.2 Access modifiers, ‘this’ keyword, ‘static’ keyword. 2.3 Constructors, Default constructors, Parameterized constructors, Copy constructors, Private constructor, and Constructor Overloading. 2.4 String class, String Buffer class, Wrapper Class.	**8**	**15**
3.	**Inheritance, Interface and Packages.** 3.1 Inheritance with its type, Method overriding, ‘super’ and ‘final’ keywords, Object class. 3.2 Polymorphism, Types of Polymorphism, method overloading vs. method overriding, Dynamic method dispatch. 3.3 Abstraction, Abstract classes vs. Interfaces, implementing interfaces, extending interfaces, default method. 3.4 Package, setting a CLASSPATH, adding class and interfaces to a package, importing package, static import, access modifier and class hiding rules in a package.	**13**	**30**

4.	**Exception Handling & Multithreaded Programming** 4.1 Basic of Exception and Errors, Types of Exception, try and catch in Exception, multiple catch clauses, nested try statements, throw and throws keywords, finally clause. 4.2 Basics of Multithreading, The Java thread model and main thread, Life cycle of a thread, Creation of thread by extending Thread class, implementing Runnable interface, Thread priorities.	**10**	**25**
5.	**File handling in Java** 5.1 Introduction to Stream, types of Stream, Stream classes and its hierarchy, I/O classes: File Class, File Input Stream, File Output Stream, Input Stream Reader, Output Stream Writer, File Reader, File Writer, Buffered Reader. 5.2 Reading and writing 'text' and '.csv' files.	**6**	**15**
	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**
26	40	34	-	-	-

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:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Java: The Complete Reference	Herbert Schildt	McGraw-Hill Education, 11th Edition ISBN-13 1260440232-978 :
2	Programming with Java	Balagurusamy E.	Mcgraw Hill Education, 5th Edition ISBN-13:978-93-5134-320-2
3	Java 8 Programming Black Book	DT Editorial Services	Dreamtech Press,New Delhi, ISBN:978-93-5119-758-4

(b) Open source software and website:

1. Java Development Kit: http://www.oracle.com/technetwork/java/javase/downloads/index.html
2. https://docs.oracle.com/javase/tutorial/java/index.html

3. https://nptel.ac.in/courses/106105191
4. https://cse.iitkgp.ac.in/~dsamanta/java/index.htm
5. https://www.javatpoint.com/java-tutorial
6. https://www.tutorialspoint.com/java/index.htm
7. https://www.programiz.com/java-programming
8. https://www.geeksforgeeks.org/java/

Suggested Course Practical List:

The following practical outcomes (PrOs) are the subcomponents of the COs. These PrOs need to be attained to achieve the COs.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	A) Install JDK and Setup a Java Programming development environment by using: 1. Command Prompt (SET PATH command and using Environment Variable). 2. Any open source IDE (Eclipse, Jcreater etc) B) Test the java development environment setup by implementing a simple java program (print : "OOP with JAVA").	I	2
2	Develop programs to demonstrate use of – 1. if statement and its different form. 2. switch case statement. 3. for loop. 4. 'while' and 'do while' loop.	I	2
3	Develop a Java program to find maximum and minimum numbers from array elements.	I	2
4	A) Develop an Object Oriented Program that simulates real-world entities using classes and objects. (For example, develop a banking application, model a college system, or represent any other real-world concept through the use of classes and objects.) B) Develop a program that demonstrates method overloading.	II	2
5	A) Develop a program that shows uses of different functions of String class. B) Develop a program that shows uses of Wrapper Class to convert primitive value into object(Boxing) and object into primitive value(Un-boxing).	II	2
6	A) Develop a programs to demonstrate use of 'static' and 'this' keywords. B) Develop a program with an overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing	II	2

	object.		
7	Develop a program to demonstrate single level inheritance, multilevel inheritance, and hierarchical inheritance.	III	2
8	Develop a program with one class named shape which has two member functions named erase () and draw(). In the program we have three other subclasses: circle, triangle and square. Override methods of the superclass into subclasses.	III	2
9	Develop a java program that illustrates interface inheritance. Interface 'A1' and 'A2' are extended from interface 'A'. Interface 'A12' inherited from both 'A1' and 'A2'. Each interface declares one method and one constant. Class 'Interface_Imple' implements 'A12'. Instantiate 'Interface_Imple' and invoke each of its methods. Each method displays one of the constants.	III	2
10	Develop a program to create a Package and demonstrate how packages are used in java. And use java access modifier to demonstrate the access rules in a package.	III	2
11	Develop a program to demonstrate the use of 'super' and 'final' keywords.	III	2
12	A) Develop a program to handle multiple exceptions using multiple catch blocks. B) Develop a program to demonstrate use of throw, throws, and finally keyword.	IV	2
13	Develop a program that executes two threads. One thread will print the even numbers and the another thread will print odd numbers between 1 to 10.(Create the thread by implementing runnable interface)	IV	2
14	Develop programs to create, write, modify, read operations on Text files.	V	2
15	Develop programs to create, write, modify, read operations on .CSV files.	V	2

Note:-
More Practical Exercises can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.

List of Laboratory/Learning Resources Required:

Sr. No.	Laboratory/Learning Resources/Equipment Name with Broad Specifications	PrO. No.
1	Computer with latest configuration with Windows/Linux/Unix Operating System, JDK (Java Development Kit) Version 8 or above	All
2	Open Source Text Editors or IDE	All

Suggested Project List:

A suggestive list of projects/case study is given here. This has to match the COs. Similar projects could be assigned to students by the concerned course teacher:

Case Study 1: Develop a Banking management application that provides following services to customers.

1. Customers can view their account details such as type of account, available balance etc.
2. He/she can perform transactions (i. e. Cash Deposit and Withdraw).

Case Study 2: Develop a simple college management application that provides following services.

1. Stores Details of college, departments, and students (use inheritance to define class hierarchy).
2. Shows exam results of Students (Result of Individual student, %pass, %fail, top-3 students, etc).

Case Study 3: Develop a library book issue management system.

Suggested Activities for Students:

Other than the classroom and laboratory learning, following are the suggested student- related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should perform following activities in group and prepare reports of about 5 pages for each activity.

a) Prepare a document which differentiates Java versions.
b) Undertake projects in teams
c) Give a seminar on any relevant topics.
d) Undertake a market survey of different JAVA APIs.

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