GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3140705
Semester – IV
Subject Name: Object Oriented Programming -I

Type of course: core course

Prerequisite: None

Rationale: Object oriented Programming has become a fundamental part of software development. OOP facilitates Reuse of code, flexibility, effective problem solving. It provides a modular structure for programs and implementation details are hidden. Reuse of code lowers the cost of development.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30		50	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to java and elementary programming:** Java language specification API, JDK and IDE, Creating, compiling and Executing a simple java program, Programming style, documentation and errors, Reading input from console, identifiers and variables, Assignment statements, Named constants and naming conventions, Data Types (Numeric, Boolean, Character, String) its Operations and Literals, Evaluating Expressions and operator Precedence, Types of Operators (Augmented assignment, Increment and Decrement, Logical), operator precedence and associativity, numeric type conversions.	4
2	**Selections , Mathematical functions and loops:** If statements, Two way, Nested if and multi-way if statements, Switch statements, Conditional Expressions, Common mathematical functions ,While , do-while and for loop, nested loops, Keyword break and continue.	4
3	**Methods and Arrays:** Defining and calling method, Passing argument by values, Overloading methods and scope of variables, Method abstraction and stepwise refinement, Single Dimensional arrays, copying arrays ,Passing and returning array from method, Searching and sorting arrays and the Array class, Two-Dimensional array and its processing, Passing Two-dimensional Array to methods, Multidimensional Arrays.	6
4	**Objects and Classes:** Defining classes for objects, Constructors, accessing objects via reference variable, using classes from the java library, static variables, constants and methods, visibility modifiers and Data field encapsulation, passing objects to methods, array of objects, immutable	4

	objects and classes, scope of variable and the this reference.	
5	**Object oriented thinking:** Class abstraction and Encapsulation, thinking in objects and class relationships, Primitive data type and wrapper class types, Big integer and Big decimal class, string class, String Builder and String Buffer class, super class and subclass, using super keyword, overriding and overloading methods, polymorphism and dynamic binding, casting objects and instanceof operator, The ArrayList class and its methods, The protected data and methods.	**5**
6	**Exception Handling, I/O, abstract classes and interfaces:** Exception types, finally clause, rethrowing Exceptions, chained exceptions, defining custom exception classes, file class and its input and output, Reading data from web, Abstract classes, interfaces, Comparable and Cloneabal interface.	**4**
7	**JAVAFX basics and Event-driven programming and animations:** Basic structure of JAVAFX program, Panes, UI control and shapes, Property binding, the Color and the Font class, the Image and Image-View class, layout panes and shapes, Events and Events sources, Registering Handlers and Handling Events, Inner classes, anonymous inner class handlers, mouse and key events, listeners for observable objects, animation	**5**
8	**JAVAFX UI controls and multimedia:** Labeled and Label, button, Checkbox, RadioButton, Textfield, TextArea, Combo Box, ListView, Scrollbar, Slider, Video and Audio.	**4**
9	**Binary I/O ,Recursion and Generics:** Text I/O, binary I/O, Binary I/O classes, Object I/o, Random Access files, Problem solving using Recursion, Recursive Helper methods, Tail Recursion, Defining Generic classes and interfaces, Generic methods, Raw types and backward compatibility, wildcard Generic types, Erasure and Restrictions on Generics.	**4**
10	**List, Stacks, Queues and Priority Queues:** Collection, Iterators, Lists, The Comparator interface, static methods for list and collections, Vector and Stack classes, Queues and priority Queues.	**4**
11	**Sets and Maps:** Comparing the performance of Sets and Lists, singleton and unmodifiable collections and Maps.	**2**
12	**Concurrency** **Thread states and life cycle,Creating and Executing threads with the Executor Framework, Thread synchronization**	**2**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**50**	**10**			

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1) **Intro to Java Programming, 10th edition, Y.Daniel Liang, Pearson**

2) **Object oriented programming with Java , Rajkumar Buyya,S Thamarai Selvi, Xingchen Chu, McGrawHill**

3) **Programming in Java, Sachin Malhotra, Saurabh Choudhary, Oxford**

4) **Programming with JAVA , E Balagurusamy, McGrawHill**

5) **CORE JAVA volume -I Cay Horstmann, Pearson**

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Use various Java constructs, features and libraries for simple problems.	20
CO-2	Demonstrate how to define and use classes, interfaces, create objects and methods, how to override and overload methods, compile and execute programs.	20
CO-3	Write a program using exception handling, multithreading with synchronization.	20
CO-4	Write a program using Files, binary I/O, collection Frameworks for a given problem.	30
CO-5	Design and develop GUI based applications in a group using modern tools and frameworks.	10

List of Experiments:

(1)	Write a Program that displays Welcome to Java, Learning Java Now and Programming is fun.

(2)	Write a program that solves the following equation and displays the value x and y: 1) 3.4x+50.2y=44.5 2) 2.1x+.55y=5.9 (Assume Cramer's rule to solve equation ax+by=e x=ed-bf/ad-bc cx+dy=f y=af-ec/ad-bc)
(3)	Write a program that reads a number in meters, converts it to feet, and displays the result.
(4)	Body Mass Index (BMI) is a measure of health on weight. It can be calculated by taking your weight in kilograms and dividing by the square of your height in meters. Write a program that prompts the user to enter a weight in pounds and height in inches and displays the BMI. Note:- 1 pound=.45359237 Kg and 1 inch=.0254 meters.
(5)	Write a program that prompts the user to enter three integers and display the integers in decreasing order.
(6)	Write a program that prompts the user to enter a letter and check whether a letter is a vowel or constant.
(7)	Assume a vehicle plate number consists of three uppercase letters followed by four digits. Write a program to generate a plate number.
(8)	Write a program that reads an integer and displays all its smallest factors in increasing order. For example if input number is 120, the output should be as follows:2,2,2,3,5.
(9)	Write a method with following method header. public static int gcd(int num1, int num2) Write a program that prompts the user to enter two integers and compute the gcd of two integers.
(10)	Write a test program that prompts the user to enter ten numbers, invoke a method to reverse the numbers, display the numbers.
(11)	Write a program that generate 6*6 two-dimensional matrix, filled with 0's and 1's , display the matrix, check every raw and column have an odd number's of 1's.
(12)	Write a program that creates a Random object with seed 1000 and displays the first 100 random integers between 1 and 49 using the NextInt (49) method.
(13)	Write a program for calculator to accept an expression as a string in which the operands and operator are separated by zero or more spaces. For ex: 3+4 and 3 + 4 are acceptable expressions.
(14)	Write a program that creates an Array List and adds a Loan object , a Date object , a string, and a Circle object to the list, and use a loop to display all elements in the list by invoking the object's to String() method.
(15)	Write the bin2Dec (string binary String) method to convert a binary string into a decimal number. Implement the bin2Dec method to throw a NumberFormatException if the string is not a binary string.
(16)	Write a program that prompts the user to enter a decimal number and displays the number in a fraction. Hint: Read the decimal number as a string, extract the integer part and fractional part from the string.
(17)	Write a program that displays a tic-tac-toe board. A cell may be X, O, or empty. What to display at each cell is randomly decided. The X and O are images in the files X.gif and O.gif.
(18)	Write a program that moves a circle up, down, left or right using arrow keys.
(19)	Write a program that displays the color of a circle as red when the mouse button is pressed and as blue when the mouse button is released.

(20)	Write a GUI program that use button to move the message to the left and right and use the radio button to change the color for the message displayed.
(21)	Write a program to create a file name 123.txt, if it does not exist. Append a new data to it if it already exist. write 150 integers created randomly into the file using Text I/O. Integers are separated by space.
(22)	Write a recursive method that returns the smallest integer in an array. Write a test program that prompts the user to enter an integer and display its product.
(23)	Write a generic method that returns the minimum elements in a two dimensional array.
(24)	Define MYPriorityQueue class that extends Priority Queue to implement the Cloneable interface and implement the clone() method to clone a priority queue.
(25)	Write a program that reads words from a text file and displays all the nonduplicate words in descending order.The text file is passed as a command-line argument.

Major Equipment:

Computer, Laptop

List of Open Source Software/learning website:

https://www.tutorialspoint.com/java/

https://www.javatpoint.com/java-programs