SARVAJANIK UNIVERSITY
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SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech II (Semester III)

Subject Name: Object Oriented Programming **Subject Code:** BTCO13304
Type of course: Professional Core Course
Prerequisite (if any): -

Rationale: This course introduces advanced programming skills and focuses on the core concepts of object-oriented programming and design using a high-level language, Java. The course focuses on the understanding and practical mastery of object-oriented concepts such as classes, objects, data abstraction, methods, method overloading, inheritance, and polymorphism.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Contents	Total Hours
1.	**Basics of Java Programming :** Features of Java, Concepts of JDK, bytecode, JVM and platform independency, Creating, compiling and executing a simple java program, variables, constants, naming conventions, data types, operators, operator precedence and associativity, expressions evaluation, type conversion, reading input from console, Flow control in Java.	05
2.	**Class Fundamentals :** General form of class, creating class and object, overloading methods, constructor, constructor overloading, passing and returning object to and from methods, assigning object reference variables, introducing access control, understanding static, final, this keyword, Garbage collection and the finalize () method, wrapper classes	05

Suggested Specification table with Marks (Theory): (For B. Tech only)

3.	**Array and String Handling :** Array basics, String class, Array of Strings, StringBuffer and StringBuilder class, String Tokenizer Class, Command line arguments	03
4.	**Inheritance, Interfaces and Packages : Inheritance :** Concept of Inheritance, super class, sub class, Inheriting data members and methods, access modifiers in inheritance, multilevel inheritance, constructors in inheritance, method overriding, dynamic method dispatch and runtime polymorphism, instanceof operator, super keyword, using final with inheritance, Object class - super class of all the classes, abstract classes **Interfaces :** Defining Interface, Default Methods, Implementing Interface, Variables in Interface **Package :** Concepts of Package, creating own package, CLASSPATH, Importing package-using import statement, access modifiers	08
5.	**Exceptions Handling :** Exception handling fundamentals, Exception and Error, Use of try, catch, throw, throws and finally, Built-in exceptions, Creating custom exceptions	04
6.	**Multithreading in Java :** Concepts of Multithreading, Main thread, Life cycle of thread, Thread class and Runnable interface, Creating thread by extending Thread class, creating thread by implementing Runnable interface, Creating multiple threads, Thread priorities, Thread synchronization, Thread communication, Deadlock	05
7.	**Input/output Programming and Collection Classes: I/O :** File Class, Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader **Collection Classes :** List, Queue and Set	05
8.	**JAVAFX**: Basics - 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. Event Handling - Events and Events sources, Registering Handlers and Handling Events, Inner classes, anonymous inner class handlers, mouse and key events, listeners for observable objects. Animation. UI controls - Label, button, Checkbox, RadioButton, Textfield, TextArea, Combo Box, ListView, Scrollbar, Slider.	10

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

15	15	15	5	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (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:

Sr. No	Title of Book /Article	Author(s)	Publisher and details like ISBN	Year of Publication	Publication Edition
1.	Java – The Complete Reference	Herbert Schildt	Oracle Press	10 December 2020	11th Edition
2.	Java Fundamentals	Herbert Schildt, Dale Skrien	McGraw Hill Education	1 July 2017	1st Edition
3.	Introduction to Java Programming and Data Structures, Comprehensive Version	Pearson Education	Y. Daniel Liang	17 May 2017	11th Edition
4.	Core Java Volume-I Fundamentals	Pearson Education	Cay S. Horstmann, Gray Cornell	1st January 2013	9th Edition

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.	20
CO-5	Design and develop GUI based applications in a group using modern tools and frameworks.	20

List of Open learning website:

1. https://www.tutorialspoint.com/java/index.htm
2. https://www.w3schools.com/java/
3. https://www.javatpoint.com/java-tutorial
4. https://docs.oracle.com/javase/tutorial/
5. https://www.programiz.com/java-programming
6. https://docs.oracle.com/javafx/2/get_started/jfxpub-get_started.htm

List of Open Source Software:

1. Eclipse
2. Netbeans IDE
3. IntelliJ IDEA
4. VSCodium

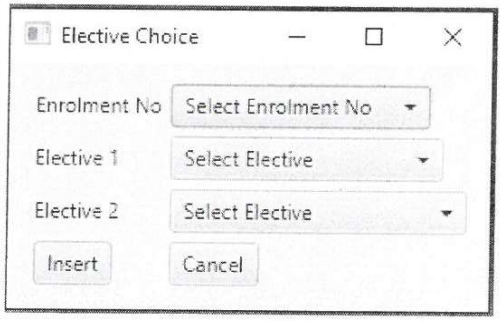
List of Experiments:

Sr. No	Practical
1	Write a program which takes two numbers and an operator from the user and performs mathematical operation on entered two numbers.
2	Write a program that sorts the integer numbers taken from the user as an input.
3	Write a program to validate the entered password. The password must have one capital letter, one digit and one special character from {$, #, %} set. The length of password must be at least 8 characters. The program should display "Password is Valid" If the password satisfies above criteria, otherwise it should display "Password is Invalid".

4	Write a program to find the factorial of a given number. Take the number through the command line argument.
5	Design a class named Triangle to represent a Triangle. The class contains: • Three double data fields named a, b and c specifying three sides of the triangle. The default values are 1. • A no-arg constructor that creates a default triangle. • A constructor that creates a triangle with the specified values. • A method named getArea() that returns the area of this triangle. • A method named getPerimeter() that returns the perimeter.
6	Design a class named StopWatch. The class contains: • Private data fields startTime and endTime with getter methods. • A no-arg constructor that initializes startTime with the current time. • A method named start() that resets the startTime to the current time. • A method named stop() that sets the endTime to the current time. • A method named getElapsedTime() that returns the elapsed time for the stopwatch in milliseconds.
7	Create a class called Time containing followings: • Two private data fields Hour and Minute • No-argument constructor and parameterized constructor • A method getTime() that asks the user to enter the values of both fields • A method ahead() which displays which object is ahead from other • A method add() that performs addition of two objects and returns a third object • A method showTime() to display time object
8	Write a simple java application that defines a class Complex with real(int) and img(int) as data fields, no-argument constructor and parameterized constructor. The class should have

	overloaded methods to perform addition of two Complex numbers by passing objects as arguments. Demonstrate this keyword in a parameterized constructor.
9	Write a simple java application that defines a class Student with roll_no(int), name(String), address(String) & branch(String) as data fields. The class should have getData() & showData() methods. The program should create an array of Student objects, get the details and display it. Create branchDisplay(student[] s) static method to display all objects having computer branch.
10	Demonstrate the static data field and static method by creating an appropriate class. Demonstrate this class in the main method by creating different objects.
11	Write a simple java application that creates a Player class. Inherit CricketPlayer class from Player class. Inherit Batsman & Bowler classes from CricketPlayer class. Assume suitable data and member methods.
12	Write a simple java application that creates a Shape class with two double data members. The class should have an area method to calculate the area of shape. Inherit two classes Rectangle and Triangle from Shape class. Demonstrate method overriding & super keyword.
13	Write a simple java application that creates a Shape class with two double data members. The class should have one abstract method area to calculate the area of shape. Inherit two classes Rectangle and Triangle from Shape class. Demonstrate runtime polymorphism.
14	Write a simple java application that creates an interface Shape. The interface declares read() and show() methods and PI as constant data member. Create classes Rectangle and Circle that implement a Shape interface. Assume suitable data and member methods.
15	Create two packages, CE_Dept & IT_Dept with Machine_Detail_CE and Machine_Detail_IT classes respectively. The class should have a method to display machine information (No_of_PC(int), configuration(String)) for both departments. Write a java application that imports both defined packages and call their methods.

16	Write a simple java application that reads marks of five subjects through command line arguments and displays the average. The application should generate an exception if marks are not in integer format and out of 0-100.
17	Write a simple java application that declares Employee class. The program should generate and handle custom exceptions such as a. InvalidEmailAddressException if the address does not contain . and @ b. InvalidTelephoneNumberException if total no of digits > 10.
18	Write a simple java application that creates two threads: One thread creates even numbers and another thread creates odd numbers.
19	Implement producer consumer IPC problem using multi-threading.
20	Write a simple JAVAFX application for user authentication as shown below.  When the user clicks the Login button, if User ID is "administrator" and Password is "root", Login Successful should be displayed on the terminal, otherwise Invalid User ID or Password should be displayed. If the user clicks the cancel button, the login form should disappear.
21	Write a simple JAVAFX application to fetch a student's elective subject choice as shown below.



When a user selects his/her enrolment number, respective elective choices and clicks Insert button, the following message should be displayed in the terminal.

"Enrolmentno 10 selected Software Engineering and Python for Data Science"

If the user clicks the cancel button, the form should disappear.