# Lovely Professional University, Punjab

| Course Code | Course Title | Course Planner | Lectures | Tutorials | Practicals | Credits |
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| CSE310 | PROGRAMMING IN JAVA | 16920::Ravi Kant Sahu | 0 | 0 | 5 | 3 |
| **Course Weightage** | ATT: 5 CA: 30 MTT: 20 ETT: 45 | **Exam Category: 13: Mid Term Exam: All MCQ – End Term Exam: MCQ + Subjective** | | | | |
| **Course Orientation** | ENTERPRENEURSHIP, PLACEMENT EXAMINATION, PLACEMENT EXAMINATION(Mass Recruiters) | | | | | |

| | **TextBooks ( T )** | | |
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| **Sr No** | **Title** | **Author** | **Publisher Name** |
| T-1 | JAVA SE 8 FUNDAMENTALS KIT | ORACLE | ORACLE PRESS |

| | **Reference Books ( R )** | | |
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| **Sr No** | **Title** | **Author** | **Publisher Name** |
| R-1 | JAVA THE COMPLETE REFERENCE | HERBERT SCHILDT | Tata McGraw Hill, India |
| R-2 | INTRODUCTION TO JAVA PROGRAMMING | Y. DANIEL LIANG | PEARSON |

| **Relevant Websites ( RW )** | | |
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| **Sr No** | **(Web address) (only if relevant to the course)** | **Salient Features** |
| RW-1 | http://www.tutorialspoint.com/java8/ | Tutorials give a clear understanding of concepts in easy and simplified manner |
| RW-2 | https://docs.oracle.com/javase/8/ | Updated and authentic documentation of latest features is available |

| **Audio Visual Aids ( AV )** | | |
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| **Sr No** | **(AV aids) (only if relevant to the course)** | **Salient Features** |
| AV-1 | https://www.youtube.com/watch?v=DCUrl67S8zg&list=PLzHR_gxR3bpD_l0bMLVWKYLenNexi1YZ5 | Basics elaborated with focus on professional certifications |
| AV-2 | http://freevideolectures.com/Course/2513/Java-Programming | Video lectures on basics constructs of Java Programming |

| **Software/Equipments/Databases** | | |
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| **Sr No** | **(S/E/D) (only if relevant to the course)** | **Salient Features** |
| SW-1 | Netbeans | IDE to develop simple to complex application development in convenient and faster way |
| SW-2 | JDK 1.8, Command Prompt and Text Editor | For writing, compiling and testing basic java constructs |

**LTP week distribution: (LTP Weeks)**

An instruction plan is only a tentative plan. The teacher may make some changes in his/her teaching plan. The students are advised to use syllabus for preparation of all examinations. The students are expected to keep themselves updated on the contemporary issues related to the course. Upto 20% of the questions in any examination/Academic tasks can be asked from such issues even if not explicitly mentioned in the instruction plan.

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| **Weeks before MTE** | 7 |
| **Weeks After MTE** | 7 |
| **Spill Over (Lecture)** | 9 |

## Detailed Plan For Lectures

| Week Number | Lecture Number | Broad Topic(Sub Topic) | Chapters/Sections of Text/reference books | Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs | Lecture Description | Learning Outcomes | Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned | Live Examples |
|---|---|---|---|---|---|---|---|---|
| Week 1 | Lecture 1 | Java Platform Overview (Defining how the Java language achieves platform independence) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-1 | Lecture 0: Introduction to course contents, outcomes, Syllabus, Instruction Plan and Academic Tasks<br>Lecture 1: Defining how the Java language achieves platform independence, Differentiating between the Java ME, Java SE, and Java EE Platforms | Understanding how Java achieves Platform Independence and various editions of Java and their applications | Lecture cum discussion and brain storming | Java application can be executed without recompiling on various platforms and devices. |
| | | Java Platform Overview (Differentiating between the Java ME, Java SE, and Java EE Platforms) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-1 | Lecture 0: Introduction to course contents, outcomes, Syllabus, Instruction Plan and Academic Tasks<br>Lecture 1: Defining how the Java language achieves platform independence, Differentiating between the Java ME, Java SE, and Java EE Platforms | Understanding how Java achieves Platform Independence and various editions of Java and their applications | Lecture cum discussion and brain storming | Java application can be executed without recompiling on various platforms and devices. |
| | Lecture 2 | Java Platform Overview (Defining how the Java language achieves platform independence) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-1 | Lecture 0: Introduction to course contents, outcomes, Syllabus, Instruction Plan and Academic Tasks<br>Lecture 1: Defining how the Java language achieves platform independence, Differentiating between the Java ME, Java SE, and Java EE Platforms | Understanding how Java achieves Platform Independence and various editions of Java and their applications | Lecture cum discussion and brain storming | Java application can be executed without recompiling on various platforms and devices. |

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| Week 1 | Lecture 2 | Java Platform Overview (Differentiating between the Java ME, Java SE, and Java EE Platforms) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-1 | Lecture 0: Introduction to course contents, outcomes, Syllabus, Instruction Plan and Academic Tasks<br>Lecture 1: Defining how the Java language achieves platform independence, Differentiating between the Java ME, Java SE, and Java EE Platforms | Understanding how Java achieves Platform Independence and various editions of Java and their applications | Lecture cum discussion and brain storming | Java application can be executed without recompiling on various platforms and devices. |
| | Lecture 3 | Java Platform Overview (Evaluating Java libraries, middle-ware, and database options) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-2 | Evaluating Java libraries, middle-ware, and database options and defining how the Java language continues to evolve | Understanding applications of various libraries, database options and evolution of Java | Lecture cum discussion and brain storming | Demonstration of various libraries and their applications |
| | | Java Platform Overview (Defining how the Java language continues to evolve) | T-1<br>R-1 | RW-1<br>RW-2<br>AV-2 | Evaluating Java libraries, middle-ware, and database options and defining how the Java language continues to evolve | Understanding applications of various libraries, database options and evolution of Java | Lecture cum discussion and brain storming | Demonstration of various libraries and their applications |
| | Lecture 4 | What Is a Java Program? (Introduction to Computer Programs) | T-1<br>R-1 | RW-2<br>SW-2<br>AV-1 | Describing basics of Computer Program and main features of Java Language | Understanding basics of Computer Programs and various features of Java Language | Lecture cum discussion and brain storming | Sample programs in programming languages |
| | | What Is a Java Program? (Key Features of the Java Language) | T-1<br>R-1 | RW-2<br>SW-2<br>AV-1 | Describing basics of Computer Program and main features of Java Language | Understanding basics of Computer Programs and various features of Java Language | Lecture cum discussion and brain storming | Sample programs in programming languages |
| | Lecture 5 | What Is a Java Program? (The Java Technology and Development Environment) | T-1<br>R-1 | RW-2<br>SW-1<br>SW-2<br>AV-1<br>AV-2 | Introduction to JDK 8, Writing, Compiling and Executing Java programs | Understanding of Java application development environment, various tools and steps for Java program execution | Lecture cum discussion and basic program execution | Basic Program creation, compilation and execution e.g to print "Hello World" on console |
| | | What Is a Java Program? (Running/testing a Java program) | T-1<br>R-1 | RW-2<br>SW-1<br>SW-2<br>AV-1<br>AV-2 | Introduction to JDK 8, Writing, Compiling and Executing Java programs | Understanding of Java application development environment, various tools and steps for Java program execution | Lecture cum discussion and basic program execution | Basic Program creation, compilation and execution e.g to print "Hello World" on console |

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| Week 2 | Lecture 6 | Creating a Java Main Class (Java Classes) | T-1 | RW-2<br>SW-1<br>SW-2<br>AV-2 | Detailed concepts associated with Classes and Main method. | Understanding concepts and conventions associated with Classes and main methods | Lecture cum discussion and brain storming | Programs to test various naming conventions and other associated concepts of Main class and method. |
| | | Creating a Java Main Class (The main Method) | T-1 | RW-2<br>SW-1<br>SW-2<br>AV-2 | Detailed concepts associated with Classes and Main method. | Understanding concepts and conventions associated with Classes and main methods | Lecture cum discussion and brain storming | Programs to test various naming conventions and other associated concepts of Main class and method. |
| | Lecture 7 | Creating a Java Main Class (Java Classes) | T-1 | RW-2<br>SW-1<br>SW-2<br>AV-2 | Detailed concepts associated with Classes and Main method. | Understanding concepts and conventions associated with Classes and main methods | Lecture cum discussion and brain storming | Programs to test various naming conventions and other associated concepts of Main class and method. |
| | | Creating a Java Main Class (The main Method) | T-1 | RW-2<br>SW-1<br>SW-2<br>AV-2 | Detailed concepts associated with Classes and Main method. | Understanding concepts and conventions associated with Classes and main methods | Lecture cum discussion and brain storming | Programs to test various naming conventions and other associated concepts of Main class and method. |
| | Lecture 8 | Data In the Cart(Introducing variables) | T-1<br>R-1 | RW-2<br>SW-2<br>AV-2 | Working with variables, rules for identifier creation and working with String type | Understanding of variable creation and usage including String type | Lecture cum demonstration and discussion | Program for using variable of primitive data types and String |
| | | Data In the Cart(Working with Strings) | T-1<br>R-1 | RW-2<br>SW-2<br>AV-2 | Working with variables, rules for identifier creation and working with String type | Understanding of variable creation and usage including String type | Lecture cum demonstration and discussion | Program for using variable of primitive data types and String |
| | Lecture 9 | Data In the Cart(Working with numbers) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation and handling of all numeric types in Java | Understanding of requirement and usage of various numeric data types in Java | Lecture cum demonstration and discussion | Program to manipulate various numeric data types |
| | | Data In the Cart (Manipulating numeric data) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation and handling of all numeric types in Java | Understanding of requirement and usage of various numeric data types in Java | Lecture cum demonstration and discussion | Program to manipulate various numeric data types |

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| Week 2 | Lecture 10 | Managing Multiple Items (Working with Conditions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Working with single/multiple if and if-else statements | Understanding precise usage of if and if-else statements | Lecture cum demonstration and discussion | Program to display Grades on basis of marks |
| Week 3 | Lecture 11 | Managing Multiple Items (Working with a List of Items) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation and usage of One dimensional arrays and enumeration using Enum | Understanding of handling multiple items | Lecture cum demonstration and discussion | Program to find smallest, largest, average and to display month and day using Enum |
| | | Managing Multiple Items (Processing a list of items) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation and usage of One dimensional arrays and enumeration using Enum | Understanding of handling multiple items | Lecture cum demonstration and discussion | Program to find smallest, largest, average and to display month and day using Enum |
| | Lecture 12 | More on Conditionals (Relational and conditional operators) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Using various relational operators, short circuit operator, nested if-else, if-else ladder and conditional operator | Understanding of various ways to work with conditions | Lecture cum demonstration and discussion | Program to test mentioned concepts |
| | | More on Conditionals(More ways to use if/else constructs) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Using various relational operators, short circuit operator, nested if-else, if-else ladder and conditional operator | Understanding of various ways to work with conditions | Lecture cum demonstration and discussion | Program to test mentioned concepts |
| | Lecture 13 | More on Conditionals(Using Switch Statements) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Switch statement and Netbeans Debugger | Understanding of using switch statements instead of multiple if-else statements and NetBeans Debugger | Lecture cum demonstration and discussion | Program to display grade if obtained marks are given |
| | | More on Conditionals(Using the NetBeans Debugger) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Switch statement and Netbeans Debugger | Understanding of using switch statements instead of multiple if-else statements and NetBeans Debugger | Lecture cum demonstration and discussion | Program to display grade if obtained marks are given |
| | Lecture 14 | Describing Objects and Classes(Working with objects and classes) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Modelling entities using classes, defining attributes and associated functionality using methods | Understanding how to model entities using classes and invoking associated functionality using objects | Lecture cum demonstration and discussion | Program to model Student, Faculty and Labs. etc. to create UMS like system. |

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| Week 3 | Lecture 15 | Describing Objects and Classes(Defining fields and methods) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Modelling entities using classes, defining attributes and associated functionality using methods | Understanding how to model entities using classes and invoking associated functionality using objects | Lecture cum demonstration and discussion | Program to model Student, Faculty and Labs. etc. to create UMS like system. |
| | | Describing Objects and Classes(Declaring, Instantiating, and Initializing Objects) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Modelling entities using classes, defining attributes and associated functionality using methods | Understanding how to model entities using classes and invoking associated functionality using objects | Lecture cum demonstration and discussion | Program to model Student, Faculty and Labs. etc. to create UMS like system. |
| | | Describing Objects and Classes(Working with Object References) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Modelling entities using classes, defining attributes and associated functionality using methods | Understanding how to model entities using classes and invoking associated functionality using objects | Lecture cum demonstration and discussion | Program to model Student, Faculty and Labs. etc. to create UMS like system. |
| Week 4 | Lecture 16 | Describing Objects and Classes(Doing more with Arrays) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using array of objects, Netbeans and Soccer league use case | Understanding of using multiple objects using array, using NetBeans and Soccer league use case | Lecture cum demonstration and discussion | Program to create record of multiple Students or Faculties |
| | | Describing Objects and Classes(Introducing the NetBeans IDE) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using array of objects, Netbeans and Soccer league use case | Understanding of using multiple objects using array, using NetBeans and Soccer league use case | Lecture cum demonstration and discussion | Program to create record of multiple Students or Faculties |
| | | Describing Objects and Classes(Introducing the Soccer League Use Case) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using array of objects, Netbeans and Soccer league use case | Understanding of using multiple objects using array, using NetBeans and Soccer league use case | Lecture cum demonstration and discussion | Program to create record of multiple Students or Faculties |
| | Lecture 17 | Creating and Using Methods (Using methods) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation of methods, passing arguments and invoking methods | Understanding how to specify and use functionalities associated with entities | Lecture cum demonstration and discussion | Program to specify various functionalities associated with Student or Faculty classes. |
| | | Creating and Using Methods (Method arguments and return values) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation of methods, passing arguments and invoking methods | Understanding how to specify and use functionalities associated with entities | Lecture cum demonstration and discussion | Program to specify various functionalities associated with Student or Faculty classes. |

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| Week 4 | Lecture 17 | Creating and Using Methods (How Arguments are Passed to a Method) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creation of methods, passing arguments and invoking methods | Understanding how to specify and use functionalities associated with entities | Lecture cum demonstration and discussion | Program to specify various functionalities associated with Student or Faculty classes. |
| | Lecture 18 | Creating and Using Methods (Static methods and variables) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1<br>AV-2 | Using static methods and polymorphism using method overloading | Understanding requirements and advantages of static methods and method overloading | Lecture cum demonstration and discussion | Program to use static methods and method overloading |
| | | Creating and Using Methods (Overloading a method) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1<br>AV-2 | Using static methods and polymorphism using method overloading | Understanding requirements and advantages of static methods and method overloading | Lecture cum demonstration and discussion | Program to use static methods and method overloading |
| | Lecture 19 | More on Arrays and Loops (Working with Dates) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using LocalDate, LocalTime, LocalDateTime classes and Using ArrayList as collection of Objects | Understanding usage of data, time and creating collection of objects | Lecture cum demonstration and discussion | Program to use date/time and arraylist |
| | | More on Arrays and Loops (The ArrayList class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using LocalDate, LocalTime, LocalDateTime classes and Using ArrayList as collection of Objects | Understanding usage of data, time and creating collection of objects | Lecture cum demonstration and discussion | Program to use date/time and arraylist |
| | Lecture 20 | More on Arrays and Loops (Working with Dates) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using LocalDate, LocalTime, LocalDateTime classes and Using ArrayList as collection of Objects | Understanding usage of data, time and creating collection of objects | Lecture cum demonstration and discussion | Program to use date/time and arraylist |
| | | More on Arrays and Loops (The ArrayList class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | Using LocalDate, LocalTime, LocalDateTime classes and Using ArrayList as collection of Objects | Understanding usage of data, time and creating collection of objects | Lecture cum demonstration and discussion | Program to use date/time and arraylist |

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| Week 5 | Lecture 21 | Manipulating and Formatting the Data in Your Program(Using the String Class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | implementation of constructors and methods of StringBuilder and String classes | Understanding of various ways to create String and StringBuilder classes and using their functionalities | Lecture cum demonstration and discussion | Program to implement various constructors and methods of String and StringBuilder classes |
| | | Manipulating and Formatting the Data in Your Program(Using the StringBuilder Class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-2 | implementation of constructors and methods of StringBuilder and String classes | Understanding of various ways to create String and StringBuilder classes and using their functionalities | Lecture cum demonstration and discussion | Program to implement various constructors and methods of String and StringBuilder classes |
| | Lecture 22 | Manipulating and Formatting the Data in Your Program(Using the Java API Docs) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Using primitive data types with type casting and using Java API documentation | Understanding usage of Java API documentation and type casting | Lecture cum demonstration and discussion | Demonstration of using Java API docs in online as well as offline, and program to test implicit/explicit type casting |
| | | Manipulating and Formatting the Data in Your Program(More about primitive data types) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Using primitive data types with type casting and using Java API documentation | Understanding usage of Java API documentation and type casting | Lecture cum demonstration and discussion | Demonstration of using Java API docs in online as well as offline, and program to test implicit/explicit type casting |
| | | Manipulating and Formatting the Data in Your Program(The remaining numeric operators) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Using primitive data types with type casting and using Java API documentation | Understanding usage of Java API documentation and type casting | Lecture cum demonstration and discussion | Demonstration of using Java API docs in online as well as offline, and program to test implicit/explicit type casting |
| | | Manipulating and Formatting the Data in Your Program(Promoting and casting variables) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Using primitive data types with type casting and using Java API documentation | Understanding usage of Java API documentation and type casting | Lecture cum demonstration and discussion | Demonstration of using Java API docs in online as well as offline, and program to test implicit/explicit type casting |

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| Week 5 | Lecture 23 | More on Arrays and Loops (Parsing the args Array) | T-1<br>R-2 | RW-1<br>SW-2 | More about loops, 2-D arrays and parsing the args array | Understanding the variations in loops and arrays | Lecture cum demonstration and brainstorming | Programs to demonstrate nested loops, command-line arguments and two-dimensional arrays |
| | | More on Arrays and Loops (Two-dimensional Arrays) | T-1<br>R-2 | RW-1<br>SW-2 | More about loops, 2-D arrays and parsing the args array | Understanding the variations in loops and arrays | Lecture cum demonstration and brainstorming | Programs to demonstrate nested loops, command-line arguments and two-dimensional arrays |
| | | More on Arrays and Loops (Alternate Looping Constructs) | T-1<br>R-2 | RW-1<br>SW-2 | More about loops, 2-D arrays and parsing the args array | Understanding the variations in loops and arrays | Lecture cum demonstration and brainstorming | Programs to demonstrate nested loops, command-line arguments and two-dimensional arrays |
| | | More on Arrays and Loops (Nesting Loops) | T-1<br>R-2 | RW-1<br>SW-2 | More about loops, 2-D arrays and parsing the args array | Understanding the variations in loops and arrays | Lecture cum demonstration and brainstorming | Programs to demonstrate nested loops, command-line arguments and two-dimensional arrays |
| | Lecture 24 | | | | BYOD-Practical 1 | | | |
| | Lecture 25 | Using Encapsulation(Access Control) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Understanding the encapsulation and need of various access specifiers | Understanding the importance of access specifiers and need of encapsulation | Lecture cum demonstration and discussion | Program to demonstrate the accessibility of members with different access specifiers |
| | | Using Encapsulation (Encapsulation) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Understanding the encapsulation and need of various access specifiers | Understanding the importance of access specifiers and need of encapsulation | Lecture cum demonstration and discussion | Program to demonstrate the accessibility of members with different access specifiers |
| Week 6 | Lecture 26 | Using Encapsulation(Access Control) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Understanding the encapsulation and need of various access specifiers | Understanding the importance of access specifiers and need of encapsulation | Lecture cum demonstration and discussion | Program to demonstrate the accessibility of members with different access specifiers |

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| Week 6 | Lecture 26 | Using Encapsulation (Encapsulation) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Understanding the encapsulation and need of various access specifiers | Understanding the importance of access specifiers and need of encapsulation | Lecture cum demonstration and discussion | Program to demonstrate the accessibility of members with different access specifiers |
| | Lecture 27 | Using Encapsulation (Overloading constructors) | T-1<br>R-2 | RW-2<br>SW-2 | Constructor overloading and constructor chaining | Understanding the need of multiple constructors and invocation of multiple constructors through chaining | Lecture cum demonstration and brainstorming | Program to demonstrate the need of multiple constructors in a class |
| | Lecture 28 | Using Inheritance(Overview of inheritance) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance and Is-A relationship among classes | Understanding the inheritance, its need and applications | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance(Working with subclasses and superclasses) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance and Is-A relationship among classes | Understanding the inheritance, its need and applications | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance (Overriding methods in the superclass) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance(Creating and extending abstract classes) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance(Making classes immutable) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | Lecture 29 | Using Inheritance(Overview of inheritance) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance and Is-A relationship among classes | Understanding the inheritance, its need and applications | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |

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| Week 6 | Lecture 29 | Using Inheritance(Working with subclasses and superclasses) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance and Is-A relationship among classes | Understanding the inheritance, its need and applications | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance (Overriding methods in the superclass) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance(Creating and extending abstract classes) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | | Using Inheritance(Making classes immutable) | T-1<br>R-2 | RW-2<br>SW-1<br>SW-2<br>AV-1 | Introduction to Inheritance, types of inheritance, abstract classes and Is-A relationship among classes | Understanding the inheritance, abstraction and its need | Lecture cum demonstration and brainstorming | Program to create sub-classes and using inherited features |
| | Lecture 30 | Using Inheritance (Introducing polymorphism) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Overriding methods and run-time polymorphism | Understanding the importance of polymorphism, method overriding and dynamic method dispatch | Lecture cum demonstration and brainstorming | Programs to demonstrate run-time polymorphism through method-overriding |
| | | Using Inheritance(Modeling business problems using Java classes) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Overriding methods and run-time polymorphism | Understanding the importance of polymorphism, method overriding and dynamic method dispatch | Lecture cum demonstration and brainstorming | Programs to demonstrate run-time polymorphism through method-overriding |
| Week 7 | Lecture 31 | Overriding Methods, Polymorphism, and Static Classes(Using access levels: private, protected, default, and public) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Need of static keyword, and various access specifiers in inheritance | Using the proper access specifiers during inheritance and overriding as per the need of problem | Lecture cum demonstration and brainstorming | Program to demonstrate the inheritance with appropriate accessibility of members |
| | | Overriding Methods, Polymorphism, and Static Classes(Overriding methods) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Need of static keyword, and various access specifiers in inheritance | Using the proper access specifiers during inheritance and overriding as per the need of problem | Lecture cum demonstration and brainstorming | Program to demonstrate the inheritance with appropriate accessibility of members |

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|---|---|---|---|---|---|---|---|---|
| Week 7 | Lecture 31 | Overriding Methods, Polymorphism, and Static Classes(Using virtual method invocation) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Need of static keyword, and various access specifiers in inheritance | Using the proper access specifiers during inheritance and overriding as per the need of problem | Lecture cum demonstration and brainstorming | Program to demonstrate the inheritance with appropriate accessibility of members |
| | | Overriding Methods, Polymorphism, and Static Classes(Using varargs to specify variable arguments) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Need of static keyword, and various access specifiers in inheritance | Using the proper access specifiers during inheritance and overriding as per the need of problem | Lecture cum demonstration and brainstorming | Program to demonstrate the inheritance with appropriate accessibility of members |
| | | Overriding Methods, Polymorphism, and Static Classes(Modeling business problems by using the static keyword) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Need of static keyword, and various access specifiers in inheritance | Using the proper access specifiers during inheritance and overriding as per the need of problem | Lecture cum demonstration and brainstorming | Program to demonstrate the inheritance with appropriate accessibility of members |
| | Lecture 32 | Overriding Methods, Polymorphism, and Static Classes(Using the instanceof operator to compare object types) | T-1<br>R-2 | | Using typecast and instanceof operator | Understanding the need of casing and using instanceof operator | Lecture cum demonstration and brainstorming | Program to demonstrate the typecasting requirement |
| | | Overriding Methods, Polymorphism, and Static Classes(Using upward and downward casts) | T-1<br>R-2 | | Using typecast and instanceof operator | Understanding the need of casing and using instanceof operator | Lecture cum demonstration and brainstorming | Program to demonstrate the typecasting requirement |
| | Lecture 33 | Overriding Methods, Polymorphism, and Static Classes(Implementing the singleton design pattern) | T-1 | | Singleton design pattern | Understanding the predefined design pattern to ensure single instance of a class | Lecture cum demonstration and brainstorming | Program to demonstrate singleton design pattern |
| | | **SPILL OVER** | | | | | | |
| Week 7 | Lecture 34 | | | | Spill Over | | | |
| | Lecture 35 | | | | Spill Over | | | |
| | | **MID-TERM** | | | | | | |
| Week 8 | Lecture 36 | Abstract and Nested Classes (Designing general-purpose base classes by using abstract classes) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Identifying of abstract and concrete functionalities of an entity and specifying abstract classes and corresponding concrete classes | Understanding creation and usage of abstract and concrete classes | Lecture cum demonstration and discussion | Program to create and use abstract and corresponding concrete classes |

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| Week 8 | Lecture 37 | Abstract and Nested Classes (Constructing abstract Java classes and subclasses) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Constructing multiple abstract Java classes and subclasses | Understanding defining abstract methods at multiple levels i.e. direct subclass is not defining all abstract methods of its parent class | Lecture cum demonstration and discussion | Program to define partial functionalities at multiple levels in hierarchy of abstract class |
| | Lecture 38 | Abstract and Nested Classes (Applying final keyword in Java) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Using final keyword | Understanding various uses of final keyword | Lecture cum demonstration and discussion | Program to test various uses of final keyword |
| | Lecture 39 | Abstract and Nested Classes (Distinguish between top-level and nested classes) | T-1<br>R-1<br>R-2 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Inner class, static nested class | Understanding encapsulation through nested classes | Lecture cum demonstration and discussion | Program to implement Inner and static nested class |
| | Lecture 40 | Using Interfaces (Polymorphism in the JDK foundation classes) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Polymorphism usage in JDK foundation classes, Creating and using interfaces | Understanding how polymorphism is used in JDK foundation classes and usage of interfaces | Lecture cum demonstration and discussion | Program to create and use interfaces and examples of Java Collection Framework |
| | | Using Interfaces(Using Interfaces) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Polymorphism usage in JDK foundation classes, Creating and using interfaces | Understanding how polymorphism is used in JDK foundation classes and usage of interfaces | Lecture cum demonstration and discussion | Program to create and use interfaces and examples of Java Collection Framework |
| Week 9 | Lecture 41 | Using Interfaces(Using the List Interface) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | List interface and its implementation | Understanding usage of List interface | Lecture cum demonstration and discussion | Program to implement methods of List interface |
| | Lecture 42 | Using Interfaces(Introducing Lambda expressions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Functional interface Introduction to Lambda expressions | Understanding requirement and advantages of Lambda expressions | Lecture cum demonstration and discussion | Program to implement functional interfaces |
| | Lecture 43 | | | | BYOD-Practical 2 | | | |
| | Lecture 44 | Interfaces and Lambda Expressions(Defining a Java interface) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Using multiple interfaces, Choosing between interface inheritance and class inheritance | Understanding usage of multiple interfaces | Lecture cum demonstration and discussion | Program to use multiple and nested interfaces |
| | | Interfaces and Lambda Expressions(Choosing between interface inheritance and class inheritance) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Using multiple interfaces, Choosing between interface inheritance and class inheritance | Understanding usage of multiple interfaces | Lecture cum demonstration and discussion | Program to use multiple and nested interfaces |

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| Week 9 | Lecture 45 | Interfaces and Lambda Expressions(Extending an interface) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Extending interfaces and creating default methods | Understanding requirement and usage of default methods and sub interfaces | Lecture cum demonstration and discussion | Program to create default methods and sub interfaces |
| | | Interfaces and Lambda Expressions(Defaulting methods) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Extending interfaces and creating default methods | Understanding requirement and usage of default methods and sub interfaces | Lecture cum demonstration and discussion | Program to create default methods and sub interfaces |
| Week 10 | Lecture 46 | Interfaces and Lambda Expressions(Anonymous inner classes) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Anonymous inner classes, Using Lanbda expressions | Understanding advantages of using Lambda expressions | Lecture cum demonstration and discussion | Program to create anonymous classes and converting same program through Lambda expressions. Examples of inbuilt functional interfaces e.g. Predicate, Consumer, Supplier etc. can be given |
| | | Interfaces and Lambda Expressions(Defining a Lambda Expression) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Anonymous inner classes, Using Lanbda expressions | Understanding advantages of using Lambda expressions | Lecture cum demonstration and discussion | Program to create anonymous classes and converting same program through Lambda expressions. Examples of inbuilt functional interfaces e.g. Predicate, Consumer, Supplier etc. can be given |
| | Lecture 47 | Exceptions and Assertions (Handling Exceptions: An overview) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Overview of Exception propagation and handling using try, catch, throw, throws and finally keywords | Understanding exception and Exception handling mechanism in Java | Lecture cum demonstration and discussion | Program to analyze various scenarios of Exceptions and corresponding error messages |

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| Week 10 | Lecture 47 | Exceptions and Assertions (Propagation of exceptions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Overview of Exception propagation and handling using try, catch, throw, throws and finally keywords | Understanding exception and Exception handling mechanism in Java | Lecture cum demonstration and discussion | Program to analyze various scenarios of Exceptions and corresponding error messages |
| | Lecture 48 | Exceptions and Assertions (Catching and throwing exceptions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Defining purpose of Java exceptions and using try, catch and throw statements | Understanding Exception handling using try, catch and throw | Lecture cum demonstration and discussion | Program to handle exception using try, catch and throw |
| | | Exceptions and Assertions (Defining the purpose of Java exceptions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Defining purpose of Java exceptions and using try, catch and throw statements | Understanding Exception handling using try, catch and throw | Lecture cum demonstration and discussion | Program to handle exception using try, catch and throw |
| | | Exceptions and Assertions (Using the try and throw statements) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Defining purpose of Java exceptions and using try, catch and throw statements | Understanding Exception handling using try, catch and throw | Lecture cum demonstration and discussion | Program to handle exception using try, catch and throw |
| | Lecture 49 | Exceptions and Assertions (Handling multiple exceptions and errors) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Handling multiple exceptions using multi-catch and finally clause | Understanding handling of multiple exceptions in a segment of code | Lecture cum demonstration and discussion | Program to handle exceptions using multi-catch, throws and finally |
| | | Exceptions and Assertions (Using the catch, multi-catch, and finally clauses) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Handling multiple exceptions using multi-catch and finally clause | Understanding handling of multiple exceptions in a segment of code | Lecture cum demonstration and discussion | Program to handle exceptions using multi-catch, throws and finally |
| | Lecture 50 | Exceptions and Assertions (Autoclose resources with a try-with-resources statement) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Auto closing resources with a try-with-resources statement and Recognizing common exception classes and categories i.e. checked and unchecked | Understanding auto-close of resource and categorization of exceptions | Lecture cum demonstration and discussion | Program to implement Auto-close and testing rules of checked and unchecked exceptions |
| | | Exceptions and Assertions (Recognizing common exception classes and categories) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Auto closing resources with a try-with-resources statement and Recognizing common exception classes and categories i.e. checked and unchecked | Understanding auto-close of resource and categorization of exceptions | Lecture cum demonstration and discussion | Program to implement Auto-close and testing rules of checked and unchecked exceptions |

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| Week 11 | Lecture 51 | Exceptions and Assertions (Creating custom exceptions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-2 | Creating custom exceptions based on application requirements | Understanding creation of custom exceptions | Lecture cum demonstration and discussion | Program to throw an exception if entered age of employee is less than eighteen years |
| | Lecture 52 | Exceptions and Assertions (Testing invariants by using assertions) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Testing invariants by using assertions | Understanding usage and requirement of Assertions | Lecture cum demonstration and discussion | Program to test invariants by using assertions |
| | Lecture 53 | I/O Fundamentals (Describing the basics of input and output in Java) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | Overview of various classes for input and output in Java | Understanding various classes of IO handling | Lecture cum demonstration and discussion | Class hierarchies of various classes of IO handling |
| | Lecture 54 | I/O Fundamentals(Read and write data from the console) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | PrintWriter and Scanner class | Understanding reading and writing to console | Lecture cum demonstration and discussion | Program to read/write from/to file using Scanner and PrintWriter class |
| | Lecture 55 | I/O Fundamentals(Using streams to read and write files) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2<br>AV-1 | FileInputStream and FileOutputStream | Understanding reading and writing to/from file using streams | Lecture cum demonstration and discussion | Program to read/write contents to/from files |
| Week 12 | Lecture 56 | I/O Fundamentals(Writing and read objects using serialization) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | IO Serialization using ObjectInputStream and ObjectOutputStream classes | Understanding process and requirement of IO serialization | Lecture cum demonstration and discussion | Program to read/write objects from/to files |
| | Lecture 57 | Collections and Generics (Creating a custom generic class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Overview of generic programming, Creating generic classes using Object class and by not using Object class, Creating generic methods, Creating generic interfaces, Using bounded types and WildCard | Understanding advantages and requirements of Generic programming | Lecture cum demonstration and discussion | |

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| Week 12 | Lecture 58 | Collections and Generics (Creating a custom generic class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Overview of generic programming, Creating generic classes using Object class and by not using Object class, Creating generic methods, Creating generic interfaces, Using bounded types and WildCard | Understanding advantages and requirements of Generic programming | Lecture cum demonstration and discussion | |
| | Lecture 59 | Collections and Generics (Creating a custom generic class) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Overview of generic programming, Creating generic classes using Object class and by not using Object class, Creating generic methods, Creating generic interfaces, Using bounded types and WildCard | Understanding advantages and requirements of Generic programming | Lecture cum demonstration and discussion | |
| | Lecture 60 | | | | BYOD-Practical 3 | | | |
| Week 13 | Lecture 61 | Collections and Generics (Using the type inference diamond to create an object) | T-1<br>R-1 | RW-1<br>RW-2<br>SW-2 | Using the type inference diamond to create an object | Understanding creation of objects by type inference diamond | Lecture cum demonstration and discussion | Program to create object by using type inference diamond |
| | Lecture 62 | Collections and Generics (Creating a collection by using generics) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Overview of Java Collection Framework | Understanding Java Collection Framework | Lecture cum demonstration and discussion | Java Collection Framework showing interfaces, abstract classes and concrete classes |
| | Lecture 63 | Collections and Generics (Implementing an ArrayList) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Implementing an ArrayList | Understanding the ArrayList and its methods | Lecture cum demonstration and discussion | Program to implement methods of ArrayList |
| | Lecture 64 | Collections and Generics (Implementing a TreeSet) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-2 | Implementing a TreeSet | Understanding requirement and implementation of TreeSet | Lecture cum demonstration and discussion | Program to implement methods of TreeSet |
| | Lecture 65 | Collections and Generics (Implementing a HashMap) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Implementing a HashMap | Understanding requirement and implementation of HashMap | Lecture cum demonstration and discussion | Program to implement methods of HashMap |

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| Week 14 | Lecture 66 | Collections and Generics (Implementing a Deque) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-1<br>SW-2 | Implementing a Deque | Understanding requirement and implementation of Deque | Lecture cum demonstration and discussion | Program to implement methods of Deque |
| | Lecture 67 | Collections and Generics (Ordering collections) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-1 | Ordering collections by using Comparator interface | Understanding ordering of elements | Lecture cum demonstration and discussion | Program to order collection |
| | Lecture 68 | Collections and Generics (Ordering collections) | T-1<br>R-2 | RW-1<br>RW-2<br>SW-1<br>SW-2<br>AV-1 | Ordering collections by using Comparator interface | Understanding ordering of elements | Lecture cum demonstration and discussion | Program to order collection |
| | | **SPILL OVER** | | | | | | |
| Week 14 | Lecture 69 | | | | Spill Over | | | |
| | Lecture 70 | | | | Spill Over | | | |
| Week 15 | Lecture 71 | | | | Spill Over | | | |
| | Lecture 72 | | | | Spill Over | | | |
| | Lecture 73 | | | | Spill Over | | | |
| | Lecture 74 | | | | Spill Over | | | |
| | Lecture 75 | | | | Spill Over | | | |

## Scheme for CA:

CA Category of this Course Code is:A0203 (2 best out of 3)

| Component | Weightage (%) |
|---|---|
| BYOD-Practical | 50 |
| BYOD-Practical | 50 |
| BYOD-Practical | 50 |

## Details of Academic Task(s)

An instruction plan is only a tentative plan. The teacher may make some changes in his/her teaching plan. The students are advised to use syllabus for preparation of all examinations. The students are expected to keep themselves updated on the contemporary issues related to the course. Upto 20% of the questions in any examination/Academic tasks can be asked from such issues even if not explicitly mentioned in the instruction plan.

| Academic Task | Objective | Detail of Academic Task | Nature of Academic Task (group/individuals) | Academic Task Mode | Marks | Allottment / submission Week |
|---|---|---|---|---|---|---|
| BYOD-Practical 1 | To evaluate basic programming skills of students. | It will have questions to implement basic object oriented programming concepts in Java. | Individual | Offline | 50 | 3 / 5 |
| BYOD-Practical 2 | To evaluate programming and logic building skills of students. | It will have questions to implement object oriented programming concepts to design small applications. | Individual | Offline | 50 | 7 / 9 |
| BYOD-Practical 3 | To evaluate programming and logic building skills of students. | It will have questions to implement object oriented programming concepts to design java applications. | Individual | Offline | 50 | 10 / 12 |