

Course: Java

Course Code: Java

Session: 2017-18

Duration: 4 Months

Assessment procedures: Proctored certification Exam (100%)

Curriculum of the Course:

Basic Level

Introduction to Java

1. Getting started with Java – installation
 - Install jdk from Synaptic Package Manager
 - Choose openjdk-6-jdk from the list of packages available
 - Mark it for installation
 - The installation will take a few seconds
 - Verify the installation
 - At the command prompt type java -version, so the version number of the jdk will be displayed
 - Run a simple java program and see if it works
 - Type javac TestProgram.java for compiling the code and java TestProgram for executing the code
2. Java - First program
 - write simple java program
 - print “My First Java Program!” on Console
 - save the file
 - file name given to the java file
 - compile the file
 - run the file
 - correct the errors
 - naming conventions for class
 - naming conventions for method
 - naming conventions for variable

Eclipse

3. Installing Eclipse
 - Install Eclipse on Ubuntu on the Terminal
 - Set up the proxy on the Terminal

- Then fetch the list of all the available softwares
 - Type `sudo apt-get update`
 - Then install eclipse on the Terminal
 - Type `sudo apt-get install eclipse`
 - Verify if Eclipse is installed on the system
 - Installing Eclipse on Debian,Kubuntu,Xubuntu
 - Installing Eclipse on Redhat
 - Installing Eclipse on Fedora,centos and suse linux
4. Getting started with Eclipse
- Eclipse is an Integrated Development Environment
 - It is a tool on which one can write, debug and run java programs easily
 - Open Dash Home and type Eclipse in the search box.
 - We get Workspace Launcher
 - On clicking on Workbench we get the Eclipse IDE
 - Go to File->New->Project and select Java Project
 - Create a project named EclipseDemo and create a class inside DemoClass
 - Learn about Package Explorer and Editor portlet
5. Hello World Program
- Open Eclipse
 - Create a Java Project named DemoProject
 - Create a class named DemoClass
 - Class name and file name will be the same
 - Eclipse suggests various possibilities as we type a command
 - Eclipse also completes the parentheses by automatically adding the closing parentheses
 - Include the statement that we want to print
 - Eclipse also completes the quotes by adding the closing quote
 - Compile and execute the program
 - Change the code to print
6. Errors and Debugging
- When writing a Java Program, here is a list of typical errors:
 - Missing semicolon(;)
 - Missing double quotes(".")
 - Mis-match of filename and classname
 - Typing the print statement in lower case

- The line which has the error will be indicated with a red cross mark on the left margin
 - The list of errors is displayed by hovering the mouse over the cross mark
 - Create a class ErrorFree with Errors, debug the code and run it
 - Eclipse also offers intelligent fixes
7. Programming features of Eclipse
- Auto completion
 - Sets the corresponding closing brace when we open the brace
 - Provides a drop-down list of methods when you start typing the code.
 - Syntax highlighting
 - Classname is highlighted in pink color and method in blue color.
 - Keyboard shortcuts
 - F11 to debug a program and Ctrl plus H to search a specific file.
 - Error highlighting
 - Cross symbol in the program denotes errors
 - Remove semicolon and error details are displayed when mouse is hovered over cross symbol.

Fundamental Programming Structures in Java

8. Numerical datatypes
- Define datatypes and numerical datatypes
 - int
 - float
 - byte
 - short
 - long
 - double
 - range of each numerical datatypes
 - declaration and initialization of numerical datatypes.
 - valid and invalid declaration
9. Arithmetic Operations
- Define an operator
 - Define arithmetic operators
 - addition
 - subtraction
 - multiplication

- division
- modulo
- simple program to demonstrate arithmetic operators
- appropriate datatypes for appropriate values
- save, compile and run the program

10. Strings

- char datatype
- letter, digit, punctuation marks, **tab**, or a space are all characters.
- Program explaining the variable and the character data.
- Introduction to strings
- Creating string by Direct Initialization
- Creating string by using new operator
- String length()
- String concat()
- String toUpperCase()
- String toLowerCase()

11. Primitive type conversions

- define type conversion or type casting
- higher order integer to lower order integer- Explicit type casting
- program to show explicit type casting
- common mistake in explicit type casting.
- program to show common mistake in explicit type casting
- lower order integer to higher order integer – Implicit type casting
- program to show implicit type casting
- char to integer
- integer to char
- program to show char to int type casting.

Control flow

12. Relational Operations

- boolean datatype
- equal to and not equal to
- less than and less than or equal to
- greater than and greater than or equal to

13. Logical Operations

- use of logical operators

- and (&&) operator
- example to explain **and** operator
- program to demonstrate **and** operator
- or (||) operator
- example to explain **or** operator
- program to demonstrate **or** operator
- not (!) operator
- program to demonstrate **or** operator
- save, compile and run the programs

14. if else construct

- Conditional Statements and types of Conditional Statements
- Use of if statement
- Syntax for if statement
- Program using if statement
- Use of if else statement
- Syntax for if else statement
- Program using if else statement
- Use of if else if statement
- Syntax for if else if statement
- Program using if else if statement

15. nested if and ternary operator

- explain nested if
- nested if syntax
- program to demonstrate nested if
- explain the control flow of the program
- explain ternary operator
- syntax for ternary operator
- explain the syntax
- program to demonstrate ternary operator
- comparison between ternary operator and nested if
- save, compile and run the program

16. switch statement

- define switch case statement
- compare switch and nested if
- switch case syntax
- working of a switch case statement

- use of keyword switch
- valid and invalid use of keyword **case**
- use of keyword default
- use of keyword break
- program to demonstrate switch case statement
- save, compile and run the program to check the output

17. while loop

- Loop control statement
- types of loop control statements
- Introduction to while loop
- syntax of while loop
- Program using while loop
- Check the output.
- Introduction to infinite loop
- loop variable modification
- Check the output
- How to terminate the infinite loop

18. for loop

- syntax
- introduction to for loop
- for loop syntax
- loop variable
- loop condition
- loop variable increment or decrement
- loop block
- flow of loop
- advantage of using loop

19. do while loop

- define do while
- do while syntax
- working of do while loop
- example of do while loop
- explain the do while programming
- save, compile and run the program to check the output
- how different is it from the while loop
- program to demonstrate the differences

Arrays

20. Introduction to Arrays

- About Arrays
- Declare an Array
- Initialize an array
- Initialization using for loop
- Index of an array elements
- change values of an array
- print the value of an array
- Advantage of an array.

21. Array operations

- `import java.util.Arrays`
- use methods from class `Arrays`
- `toString()` method
- `sort()` method
- `fill()` method
- `copyof()` method
- `copyofRange()` method
- about parameters for each method.

Classes & Objects

22. Creating class

- Whatever we can see in this world are all objects
- Objects can be categorized into groups known as class
- This is class in real world
- Human Being is an example of class in real world
- Class in java is the blue print from which individual objects are created
- Class consists defines a set of properties called variables and a set of behaviors called methods
- Syntax for creating class
- Create a simple class `Student` using Eclipse
- The `Student` class can contain properties

23. Creating Object

- An object is an instance of a class
- Each object consist of state and behavior
- Object stores its state in fields or variables

- It exposes its behavior through methods
- Reference variables
- Create a class named TestStudent
- Create an object of the Student class
- Use new operator
- Check what the reference variable contains
- Create one more object of the Student class and check what the reference variable contains

24. Instance fields

- Also known as non-static fields
- Open the TestStudent class which we have created
- Access the fields roll_number and name using dot operator
- See the output
- Initialize the field and see the output
- Change the modifier of the fields to private
- Debug the error that you get
- Change the modifier to protected
- Each object of a class will have unique values
- Create two objects of the Student class

25. Methods

- method definition
- write simple method
- method returning value
- call a method in another method
- flow of the program
- call a static method
- call a method from another class
- method signature
- method body

Constructors

26. Default constructor

- what is a constructor?
- what is a default constructor?
- when is it called?
- define a constructor

- initialize the variables
- call the constructor
- difference between constructor and method

27. Parameterized constructors

- What is a parameterized constructor?
- create constructor without parameter
- create a constructor with parameter
- assign values to the variables in the constructor
- pass arguments during the constructor call
- working of parameterized constructor
- show common errors
- resolve the errors
- create another parameterized constructor
- why to use constructor?

28. Using this keyword

- this is a reference to the current object
- helps to avoid name conflicts
- we can use this keyword inside a constructor to call another one
- the constructors must be in the same class
- explicit constructor invocation
- Explain it using the parameterized constructor code
- Make this statement the last one in the constructor
- You will get an error
- this statement should be the first one inside a constructor

29. Non-static block

- Non-static block
- Any code written between two curly brackets
- Executed for each object that is created
- Executes before constructor's execution
- can initialize instance member variables of the class
- create a class named NonStaticTest
- Create a non-static block and a constructor inside it
- Check the output
- Include multiple non-static blocks
- they will be executed in the sequence in which they appear in the class
- Check the output

- Non-static block is not a substitute for constructor

30. Constructor Overloading

- define multiple constructor
- what is constructor overloading?
- constructor with different number of parameters.
- parameters with different datatypes.
- how is constructor overloaded?
- flow of overloading process.
- advantage of constructor overloading.

31. Method Overloading

- define multiple methods.
- methods with same name.
- methods with different number of parameters.
- methods with different datatypes of parameter.
- what is method overloading?
- example for overloading method
- how to overload method?
- advantage of method overloading.
- error in method overloading.

32. Taking user input in Java

- What is BufferedReader?
- Importing three classes from Java.io package
- How to take the input from the user?
- Syntax to implement BufferedReader
- What is InputStreamReader?
- Create object of InputStreamReader
- Create object of BufferedReader
- About IOException
- About throws keyword
- Typecasting

Intermediate Level

1. Subclassing and Method Overriding

- Definition of subclassing
- Demo of subclassing using an Employee and Manager class
- Single inheritance
- Use of extends keyword

- Private members in a super class
 - Definition of method overriding
 - Annotation
 - @Override Annotation
2. Calling methods of the superclass
 - super keyword
 - Call methods of the super class
 - Constructor of the super class
 - Demo of super keyword using an Employee and Manager class
 - Single inheritance
 - Use of extends keyword
 - Private members in a super class
 3. Using final keyword
 - final keyword
 - What is final keyword and its application?
 - Where final keyword can be declared?
 - final variable
 - final static variables
 - static block
 - final variable as parameter
 - final method
 - private final method
 - final class
 4. Polymorphism
 - Polymorphism in Java
 - Run-time polymorphism
 - Virtual Method Invocation
 - Compile-time polymorphism
 - Role of JVM
 - IS-A test
 - Static binding
 - Dynamic binding
 5. Abstract Classes
 - Abstract Classes in Java
 - What are Abstract Methods
 - What are Concrete Methods

- Properties of Abstract Methods and Abstract Classes
 - How to use Abstract Methods
6. Java Interfaces
- Java Interfaces
 - Implementing Interface
 - Implementation Classes
 - Interfaces Vs Abstract classes
 - Implementing Multiple Interfaces
 - Usage of Interfaces with an example
7. Static Variables
- What is Static Variable in Java?
 - Usage of Static Variables with Example
 - Static Variables Vs Instance Variables
 - Final Static Constants
8. Static Methods
- What is static method in Java?
 - Static methods Vs Instance methods
 - Usage of static method with example
 - Passing object variables in a static method
9. Static Blocks
- What is a static block
 - Declaring and defining a static block
 - How static blocks are invoked and executed
10. Exception Handling
- What is an Exception
 - Types of Exceptions
 - Checked Exceptions
 - Unchecked Exceptions
 - Explaining *ArrayIndexOutOfBoundsException*
 - Demonstrating Checked Exceptions with example
 - Handling Exceptions using try-catch blocks
 - Explaining *ArithmeticException*
 - Demonstrating Unchecked Exceptions with example
 - Explaining *FileNotFoundException*
 - Usage of finally block
 - Explaining *NullPointerException*

11. Custom Exceptions

- What is a Custom Exception
- Demonstration of custom exception
- Custom exception example - "InvalidMarkException"
- Usage of "throw" keyword
- How to resolve errors in custom exceptions
- Resolve error using "Add throws declaration" option
- Usage of "throws" keyword
- Example for "FileNotFoundException"
- How to handle multiple exceptions
- How to use "surround with try/catch" option

List of students enrolled

1	Aastha Bubber
2	Aastha Mathur
3	Aayushi Sharma
4	Abhishek Gupta
5	Abhishek Gupta
6	Adesh Gautam
7	Ajeeta Sharma
8	Akbar Ali Khan
9	Alok Raj
10	Aman Goyal
11	Aman Jain
12	Ankit Goyal
13	Ankit Goyal
14	Ankit Kumar
15	Anmol Gupta
16	Anshu Mulchandani
17	Anshul Kumar Garg
18	Anuj Jain
19	Apoorva Gupta
20	Archit Bohra
21	Ashi Singhal
22	Ashutosh Gurjar
23	Asim Nagra
24	Avneet Kaur
25	Ayushi Gupta
26	Ayushi Khandelwal
27	Bhavesh Garg
28	Bhavya Kantiwal
29	Bhawna Mendiratta
30	Chirag Aggarwal
31	Chirag Saxena
32	Chirag Thawani

33	Deepak Kumar
34	Deepak Sharma
35	Deepak Sharma
36	Devendra Jain
37	Dharmender Gurjar
38	Divyash Singh Hura
39	Ehaab Ahmad
40	Gaurav Khandelwal
41	Harsh Bhardwaj
42	Harshita Jain
43	Heena Hariramani
44	Heena Porwal
45	Himanshu Garg
46	Himanshu Satija
47	Himanshu Sharma
48	Isha Vyas
49	Kapil Jain
50	Karan Gopal Gaur
51	Karan Suthar
52	Karishma Khandelwal
53	Kartik Maheshwari
54	Kartikeya Garg
55	Keshav Kumar Saxena
56	Keshav Mundra
57	Khushi Agrawal
58	Kishor Kumar Saini
59	Krishna Bhardwaj
60	Kunal Sharma
61	Lakshay Bajargaan
62	Manish Kumar Bansal
63	Manoj Jeswani
64	Mansi Bhalla

65	Mayank Khandelwal
66	Megha Bansal
67	Mudit Goyal
68	Mukul Garg
69	Nakul Goyal
70	Naveen Choudhary
71	Neetish Kumar
72	Neha Choudhary
73	Nikhil Paliwal
74	Nikhil Tongya
75	Nipun Kumar Jain
76	Nitisha Saini
77	Prachi Dubey
78	Punit Agarwal
79	Raj Kumar Khachawa
80	Rakesh Soni
81	Rishabh Kachhwaha
82	Ritika Gupta
83	Riya Ritu
84	Sagar Goyal
85	Saket Kumar
86	Shubham Bhargava
87	Sonal Negi
88	Swati Jain
89	Swati Priya
90	Tushar Setia
91	Upendra Upadhyay
92	Urvashi Takuli
93	Vaishali Jain
94	Vinay Pancholi
95	Vinod Sharma
96	Yukta Agrawal
97	Rishi Garg
98	Abhijeet Yadav
99	Aditya Kamma
100	Afzal Khan
101	Anmol Mathur
102	Ashutosh Choudhary
103	Avinash Jain
104	Ayushi Goyanka
105	Bablu Singh
106	Bhanu Pratap Singh Khangarot
107	Chandra Prakash
108	Devang Gandhi
109	Devansh Sharma
110	Divya Jain
111	Eshan Indolia
112	Hardik Dadhich

113	Harshit Gupta
114	Ishan Kalra
115	Kanika Agarwal
116	Kartik Arora
117	Maheep Mathur
118	Manav Charan
119	Manish Kumar Singh
120	Manmath Vasistha
121	Muskan Dosi
122	Nishant Jain
123	Paramveer Choudhary
124	Paras Makhija
125	Pawan Jangid
126	Piyush Jain
127	Raja Kumar Shah
128	Rinkal Jain
129	Ritu Mangal
130	Rohit Gupta
131	Shikha Kumari
132	Somya Rajput
133	Sumit Kumar Srivastav
134	Udita Garg
135	Vijay Gehlot
136	Vipul Garg
137	Vartika Khandelwal
138	Rivak Shah
139	Daksh Adhikari
140	Akansha Mathur
141	Akshita Khatri
142	Aman Kumar Gautum
143	Aman Mahnot
144	Ankit Na
145	Ankita Jain
146	Anmol Babbar
147	Arjun Bhatia
148	Atul Joshi
149	Deepansh Soni
150	Dheeraj Khandelwal
151	Divyansh Soni
152	Dixita Jain
153	Haroon Shakir Qureshi
154	Harsh Mertwal
155	Harsh Pandya
156	Hemant Vikani
157	Jayesh Nagar
158	Karan Raj Singh
159	Kriti Joshi
160	Latika Arora

161	Mansi Sharma
162	Mitali Jangid
163	Neha Alwani
164	Nihal Soni
165	Nitin Agnihotri
166	Peeyush Goyal
167	Pradeep Lakwal
168	Pradeep Pandey
169	Prakhar Chatter
170	Prateek Sen
171	Puneet Saxena
172	Punita Tiwari
173	Rakesh Sharma
174	Ram Mohan Jain
175	Rishabh Vyas
176	Ritika Somani
177	Rohit Sharma
178	Ruchika Jangid
179	Sakshi Agrawal
180	Sankalp Chawla
181	Shipra Agarwal
182	Shrey Agrawal
183	Shubhang Gupta
184	Siddharth Sharma
185	Simran Khandelwal
186	Sumit Mathur
187	Sunil Sharma
188	Vaibhav Sankhla
189	Vipendra Pal Rajput
190	Prateek Surana
191	Aditi Mathur
192	Aishwarya Soni
193	Alekh Pandey

194	Arushi Bhagwati
195	Asmita Purohit
196	Atul Goyal
197	Aviral Chaudhary
198	Inesh Kumar
199	Ketan Soni
200	Kuldeep Singh
201	Kumari Sukanya
202	Lavish Sharma
203	Nikhil Masheshwari
204	Nupur Gupta
205	Pranjul Gupta
206	Pratush Kumar Jha
207	Rahul Dosi
208	Shubham Bhargava
209	Deepanshu Sain
210	Purvi Mehta
211	Shashank Purohit
212	Nilisha Mitruka
213	Jacky N Gamot
214	Kanak Garg
215	Bhumika Saxena
216	Harshit Bhargava
217	Raj Agarwal
218	Bhumi Shah
219	Riitwick Krishnatri
220	Hassaan Alvi
221	Rishabh Garg
222	Vipin Mundra
223	Mayank Sharma
224	Harsha Jain
225	Pooja Sahu
226	Kishor Prajapat