LJ University

University with a Difference

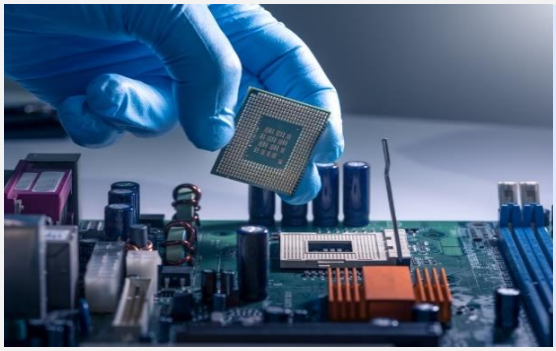
Diploma Engineering
Semester V

CE, IT, AIML, Cloud Computing & Big Data, Gaming & Animation

HANDBOOK

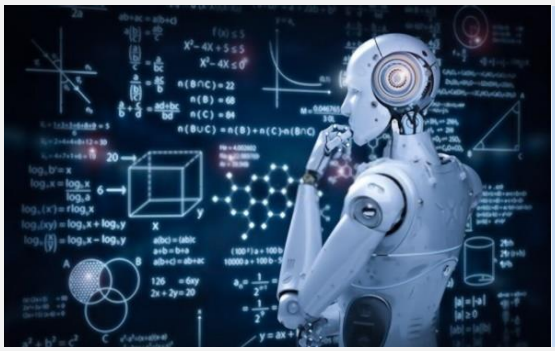
LJ Polytechnic

An Overview of Major Computer & Technology Disciplines



Computer Engineering is a branch of engineering that integrates several fields of computer science and electronic engineering required to develop computer hardware and software. Computer engineers design, test, implement and maintain computer software and hardware systems.

Information Technology (IT) is the use of computers to store or retrieve data and information. IT is typically used within the context of business operations as opposed to personal or entertainment technologies. You can find IT specialization in every branch of education, from IT & Software, Engineering, Aviation and Medicine to MBA and even Hospitality.



Artificial Intelligence (AI) is intelligence demonstrated by machines, as opposed to the natural intelligence displayed by humans or animals. AI applications include advanced web search engines, recommendation systems used by YouTube, Amazon and Netflix, Siri or Alexa, Tesla, and strategic game systems (such as chess and Go).

Cloud Computing & Big Data is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. Big data is a field that treats ways to analyze, systematically extract information from, or otherwise, deal with data sets that are too large or complex to be dealt with by traditional data-processing application software.

Gaming & Animation is the process of developing/designing a game. The effort is undertaken by a developer, ranging from a single person to an international team dispersed across the globe. Animation is a method in which figures are manipulated to appear as moving images. Various tools available in the market today, ease out the tasks of game development and animation.

Disclaimer

This handbook is compiled to provide subject information to the students. Every effort has been made to avoid errors & omissions and ensure accuracy. Any error noted may be brought to the notice of the compiler, which shall be taken care of in the updated edition of this handbook. The sources of information/material are provided in the appendix.

The information contained in this handbook is strictly for education and learning purposes and not for any commercial use.

Furthermore, The University reserves the right to unilaterally and without notice make changes to this handbook at any time.




Evaluation Methodology

Theory Marks

PA: Progressive Assessment

Units' examinations will be conducted during the semester. Each unit examination is compulsory. Unit examination may be taken from objectives, short questions, long questions, etc.

Unit-1 Exam:	Maximum Marks 10
Unit-2 Exam:	Maximum Marks 10
Unit-3 Exam:	Maximum Marks 10
Unit-4 Exam:	Maximum Marks 10
	Total Marks 40

ESE: End Semester Exam

End semester examination will be conducted from all Five (5) units and it is compulsory. It may be taken in the form of objectives, short questions, long questions etc.

End Semester Exam: Maximum Marks 50

CA: Continuous Assessment

Continuous assessment will be evaluated from the activity assigned in the semester and the attendance of that particular subject.

Activity Assessment / Attendance: Maximum Marks 10

Practical Marks

PV: Practical Viva

Practical viva will be conducted through group task. Thereafter viva will be conducted individually based on the given task of the concerned subject.

Practical Viva: Maximum Marks 30

TW: Term Work

Term work will be considered from the assignment and laboratory work done by the student during the semester of that particular subject.

Term Work: Maximum Marks 20

EVALUATION SCHEME

The performance of students is evaluated on the basis of continuous and semester-end examinations with letter grades O+++, O++, A++, B, etc. Which have numerical equivalents called grade points as indicated below:

Percentage		Grade Point	Grade	Class
95	100	10	O+++	First Class with Distinction
90	94	9.5	O++	
85	89	9	O+	
80	84	8.5	O	
75	79	8	A++	
70	74	7.5	A+	
65	69	7	A	First Class
60	64	6.5	B++	
55	59	6	B+	Higher Second Class
50	54	5.5	B	Second Class
45	49	5	C	
40	44	4.5	D	
35	39	4.0	E	Pass Class
less than 35		0	F	Fail

The performance of a student in a semester is indicated by a number called SPI (Semester Performance Index). The SPI is the weighted average of the grade points obtained in all the subjects taken by the student during the semester. Example: Suppose in a given semester a student has taken subjects having credits C1, C2, C3, C4, C5..... And the numerical equivalent of grades obtained in those subjects are G1, G2, G3, G4, and G5 respectively.

Then his/her $\text{SPI} = \frac{\text{Grade Points Earned}}{\text{Total Offered Credits}} = \frac{\sum_{i=1}^{n} Ci\ Gi}{\sum_{i=1}^{n} Ci}$

SPI will be calculated (after re-examination, if any) up to two decimal places on the basis of the final grades.

An overall assessment from the time the student entered the course is obtained by calculating PPI (Progressive Performance Index). The PPI is the weighted average of the grade points obtained in all the subjects taken by the student since he/she entered the course. It is calculated in the same manner as the SPI. The CGPA (Cumulative Grade Points Average) is the weighted average of the grade points obtained in all the subjects in the last six semesters of the course.

Detention:

Formula for conversion of equivalent percentage of PPI

An equation to find equivalence between PPI or CGPA may be obtained as follows:

Percentage Marks = (PPI or CGPA — 0.5) x 10. SPI or PPI or CGPA equivalent class shall be as follows:

Below 4.00 : Fail
4.00 – 4.49 : Pass Class
4.50 – 5.50 : Second Class
5.51 – 6.00 : Higher Second Class
6.01 – 7.49 : Firsrt Class
7.50 and above : First Class with Distinction

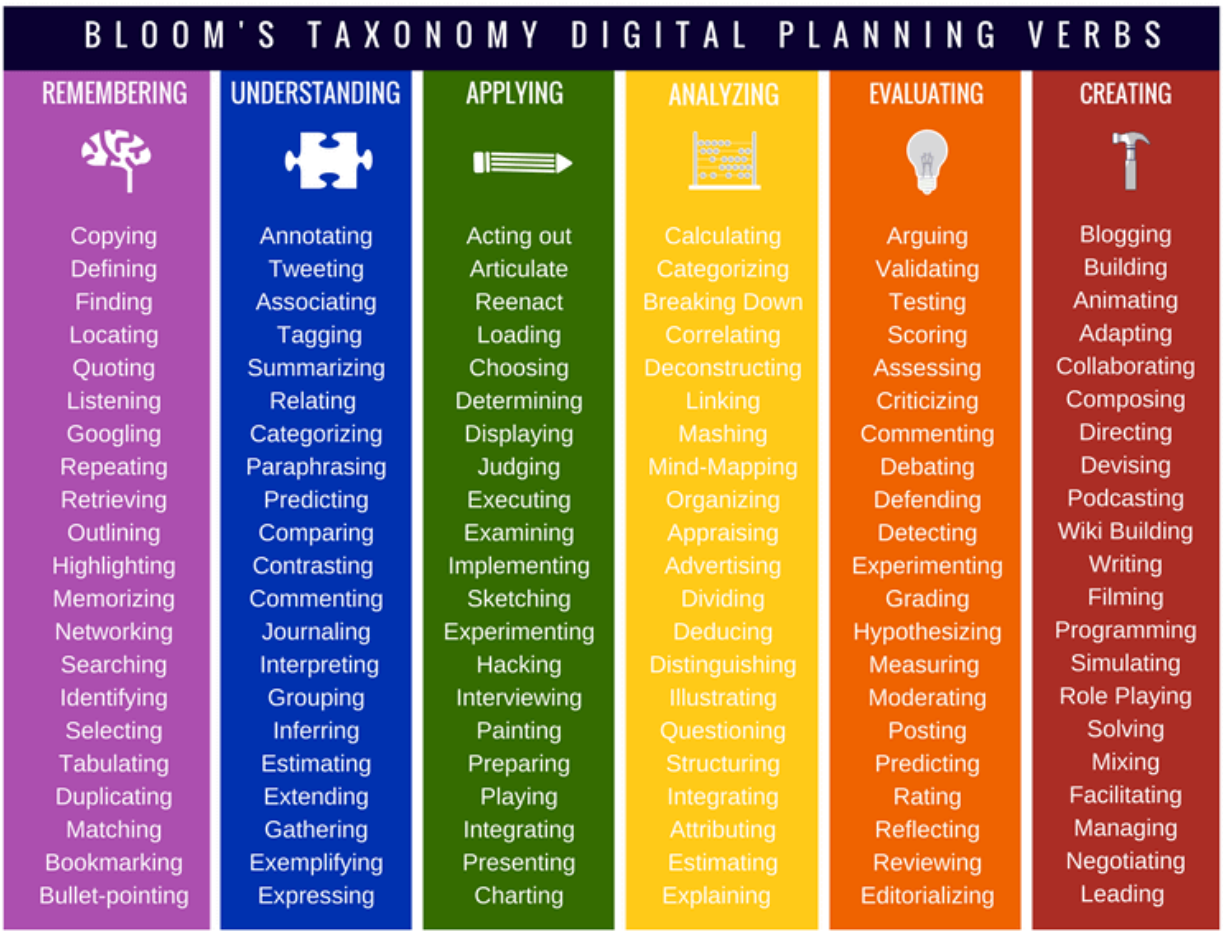
For all courses, where the duration of the course is more than 2 years, the degree shall be awarded to the students on the basis of CGPA of the last six semester's performance in the exams.

In case of the courses where duration is of two years, the degree shall be awarded to students based on PPI considering the performance in all four semesters.

About Bloom's Taxonomy

Bloom's Taxonomy is a classification of the different objectives and skills that educators set for their students (learning objectives). The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago. The terminology has been recently updated to include the following six levels of learning. These 6 levels can be used to structure the learning objectives, lessons, and assessments of your course.

1. **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
2. **Understanding:** Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
3. **Applying:** Carrying out or using a procedure for executing, or implementing.
4. **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing.
6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.



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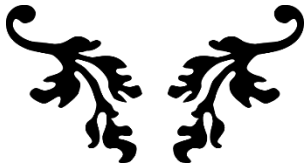
JAVA PROGRAMMING



LJ Polytechnic

Prepared and Compiled by
CE & IT Department

Course

programmme / Branch Name	Diploma in Computer Engineering					
Course Name	Java Programming				**Course Code**	025020502
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses
BSC: Basic Science Courses
ESC: Engineering Science Courses
PCC: Program Core Courses
OEC: Open Elective Courses
PEC: Program Elective Courses

Teaching and Evaluation Scheme

Teaching Hours / Week				Evaluation Scheme							
				Theory Marks				Practical Marks			Total Marks
L	**T**	**P**	**Total Credit**	**ESE**	**CA**	**PA**	**Total**	**PV**	**TW**	**Total**	
3	-	4	5	50	10	40	100	30	20	50	150

Legends: ESE: End Semester Exam
CA: Continuous Assessment (Attendance + Activity)
PA: Progressive Assessment
PV: Practical Viva
TW: Term Work

Contents

Unit No.	Topics	Sub-Topics	Learning Outcomes	% Weightage	Hours
1	**Fundamentals of Java Programming**	1.1. Introduction to Java 1.2. History of Java and Features 1.3. Java Virtual Machine and Byte Code 1.4. Types of Java program 1.5. Basic Concept of OOP 1.6. Procedure Oriented v/s Object Oriented 1.7. Write Simple Program 1.8. Basic Data Types and Operators	• Basics and history of Java • Various types of Java program • Basic OOP Concepts • Differentiate between POP and OOP • Knowledge about compiling and running a program. • Knowledge of data types and operators	15	6
2	**Control Flow and Array**	2.1. Variable and Types of Variable 2.2. Types Casting and Conversion 2.3. Wrapper Class 2.4. Decision and Control Statements 2.5. Array and Types of Array 2.6. Garbage Collection 2.7. Command Line Arguments	• Knowledge of basic programming language concepts • Basic of Wrapper class • Implement small program using decision and control statements	20	8

3	**Object Oriented Programming Concepts**	3.1. Class and Object 3.2. Constructor and Types of Constructors 3.3. Method and Method Overloading 3.4. This Keyword 3.5. Static Keyword 3.6. String Class and Its Methods 3.7. I/O Classes and File Handling	• Define class, object and method of class • Implement constructor overloading program. • Implement a string program using String class. • Knowledge of I/O Stream classes and File Handling	25	10
4	**Inheritance, Packages and Interfaces**	4.1. Basic of Inheritance 4.2. Types of Inheritance 4.3. Method Overriding 4.4. Super Keyword 4.5. Dynamic Method Dispatch 4.6. Final Keyword 4.7. Abstract Class and Method 4.8. Interface 4.9. Packages	• Describe Inheritance and Method Overriding • List types of Inheritance • Implementation of program using super and final keywords • Define Interface • Creating Package and importing Package, access rules of Package.	20	10

5	**Exception Handling and Multithreaded Programming**	5.1. Types of Error 5.2. Basic Concepts of Exception Handling 5.3. Try and Catch Block 5.4. Throw and Throws 5.5. User Define Exception 5.6. Introduction of Thread 5.7. Implementation of Thread 5.8. Thread Life Cycle. 5.9. Thread Method 5.10. Multithreading	• Explain exception and errors • List types of error and exceptions • Define throw and throws • Implement program for user defined exception. • Define thread and create thread. • Explain thread life cycle • Implement thread program	20	8
				Total Hours	**42**

Suggested Specification Table with Hours

Unit No.	Chapter Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	**U %**	**App %**	**C %**	**E %**	**An %**
1	Fundamentals of Java programming	40	30	20	-	5	5
2	Control Flow and Array	30	30	20	10	5	5
3	Object Oriented programming Concepts	20	30	30	10	5	5
4	Inheritance, Packages and Interfaces	20	20	20	10	15	15
5	Exception Handling and Multithreaded programming	20	20	30	10	10	10

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

Textbooks

1) programming with Java, E Balagurusamy.
2) Core Java Vol I : Fundamentals, Cay S. Horstmann, Gray Cornell.
3) programming in Java, Sachin Malhotra andSaurabh Choudhary.

Reference Books

1) Java: The Complete Reference, Herbert Schildt, Seventh Edition.

Open Sources (Website, Video, Movie)

1) http://www.tutorialspoint.com/Java/
2) http://www.learnJavaonline.org/
3) http://www.tutorialspoint.com/Javaexamples/

Introduction

Open-source platforms play significant role in the corporate world and are gaining popularity because these are freeware and ease of access. Java is a simple, portable, distributive, robust, secure, dynamic, architecture neutral, object-oriented programming language. This technology allows the software designed and developed once for an idealized 'virtual machine' and run on various computing platforms. Companies of all sizes are using Java as the main programming platform to develop various applications/projects worldwide. The aim of this course is that student should learn platform independent object-oriented programming and Java as base language for advanced technology like three tier architecture applications, cloud computing and web development. Many commercial applications as well as developing mission critical applications are using Java Technologies. This necessitates the corporate sectors to hire highly skilled Java developers. So, after learning this course, students can float themselves as a Java developer in the software industry as well.

Objectives

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- ✓ To understand the basic concepts and fundamentals of platform independent object oriented language.
- ✓ To demonstrate skills in writing programs using Exception Handling techniques and multithreading.
- ✓ To understand streams and efficient user interface design techniques.

Subject's Learning Outcomes

After successful completion of the course, the students are able to use the syntax and semantics of Java programming language and the basic concepts of OOP. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes. Design event driven GUI and web related applications which mimic the real word scenarios.

Fundamentals of Java Programming

Practical List

1. Install JDK, write a simple “Hello World” or similar Java program, compilation, debug, executing using a Java compiler and interpreter.
2. Write a program in Java to find the maximum of three numbers using the conditional operator.
3. The length and breadth of a rectangle are 5 and 7 respectively. Write a program to calculate the area and perimeter of the rectangle.
4. Create a class named 'Student' with String variable 'name' and integer variable 'roll_no'. Assign the value of roll_no as your enrollment number and that of name as students own name by creating an object of the class Student.

Short Questions

Q. No.	Sample Questions	Bloom’s Taxonomy
1.	List out Features of Java.	Remember
2.	List out OOP concepts.	Remember
3.	Why do we need to use OOPs?	Remember
4.	Define byte code and source code.	Remember
5.	List out types of the operator in java.	Remember
6.	List the shift operators available in Java.	Understand

Long Questions

Q. No.	Sample Questions	Bloom’s Taxonomy
1.	Explain the Features of Java.	Understand
2.	Explain basic programming structure of Java program.	Understand
3.	What are the differences between POP and OOP?	Understand
4.	Explain the Bitwise logical & shift operators with example.	Understand

Essential Assignments

1. List out Java features and explain any two of them.
2. What is the difference between JDK, JRE, and JVM?
3. Explain the scope of variables in java.
4. Explain operators used in java with examples.

Desirable Assignments

1. Explain the task of the main () method in a java programming language.
2. What is operator '+': Concatenation or Addition?
3. Write a program that prompts the user to input the length, width, and height of a box. The program then outputs the surface area and volume.
4. Suppose the values of variables 'a' and 'b' are 6 and 8 respectively, write programs to swap the values of the two variables using temp variable and without using temp variable.

   First program by using a third variable

   Second program without using any third variable

Activities

1. Create a case study report describe below.

   Consider the class student. Suggest attributes for that class and operation for this class.

Learning Outcomes

- Knowledge about Basics and history of Java
- Students can able to compiling and running a Java program.
- Understand of data types and operators.

Control Flow and Array

Practical List

1. Write a program to check whether two given Arrays are equal, given both contain the same data type and the same length.
2. Take values of the length and breadth of a rectangle from the user and check if it is square or not
3. Write a program to find the second largest element in a given Array in java.
4. Write a program in Java to display the first 10 natural numbers
5. Write a program to reverse element of array
6. Write a program to find if a number entered by user is a palindrom number of not.

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What are the types of an Array?	Remember
2.	State the importance of Garbage Collection in Java.	Understand
3.	What do you mean by declaring a variable and defining a variable?	Understand
4.	What is conditional structure? List conditional structures.	Remember
5.	Explain the use of conditional structure in java.	Undestand.
6.	What is looping structure? List looping structures.	Remember
7.	What are boxing and unboxing?	Understand

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What is need for a variable in Java? Also explain how a variable is used in Java.	Understand
2.	List different Java Control Statements. Explain any two with examples.	Remember

3.	Write a program to find if a number entered by the user is a prime number or not.	Apply
4.	Differentiate between For Loop - While Loop - Do-While Loop	Understand

Essential Assignments

1. Explain the Java Looping structure with an example
2. Explain the scope of variables in Array.
3. List different Java Control Statements. Explain with an example.
4. Difference between Array and Array List
5. What is Wrapper class? Explain use of any one wrapper class.

Desirable Assignments

1. Write a program in Java to display the multiplication table of a given integer .
2. How to remove special characters from Array List in Java?
3. Write a program to Find duplicates elements in an Array.

Activities

1. Consider real time scenario and prepared a chart on different types of conditional statements and looping statements in Java.

Learning Outcomes

- ❖ Knowledge about basic programming language concepts will be attained.
- ❖ Better understanding and application of conditional structures will be aqquired.
- ❖ In-depth knowledge about looping structures will be gained.

Object Oriented Programming Concepts

Practical List

1. Write a Java program to calculate the area of a circle using the constructor.
2. Write a program in Java to create, write, and read operations on a Text file.
3. Write a Java program to reverse a given String.
4. Write a Java program to demonstrate class and object.

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Define class and object.	Remember
2.	List Types of Constructors in Java	Remember
3.	Define constructor.	Remember
4.	What is a Static keyword in Java?	Understand
5.	What is an Abstract class in Java? How to define it?	Understand
6.	How to declare a String in Java?	Undestand.

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain copy constructor in Java.	Understand
2.	Differentiate between Method overloading and Method overriding.	Understand
3.	List methods of String class. Explain how to use the String class.	Understand
4.	Write Java syntax to create a new text file.	Understand
5.	State the difference between String and String Buffer.	Understand

Essential Assignments

1. Explain Parameterized constructor with an example.
2. Write a Java program using Copy constructor to find the area of a rectangle.

3. Explain Method overloading and Method overriding with an example.
4. In Java, how can two Strings be compared?
5. Difference between Constructor and Method in Java

Desirable Assignments

1. Write a program to create a base class Fruit that has name, taste, and size as its attributes. A method called eat() is created which describes the name of the fruit and its taste. Inherit the same in 2 other classes Apple and Orange and override the eat() method to represent each fruit taste

Activities

1. Prepare case study report on real life example of constructor.

Learning Outcomes

- Define class, object and method of class
- To understand how to implement Constructor Overloading program.
- To understand how to implement a String program using String class.
- Knowledge of I/O Stream classes and File Handling

Inheritance, Packages and Interfaces

Practical List

1. Write a Java program to demonstrate Multilevel Inheritance.
2. Write a Java program to illustrate use of Abstract class.
3. Write a program to implement the concept of Multilevel Inheritance.
4. Write a program to implement the concept of Hierarchical Inheritance.
5. Write a program to implement the concept of Interface.

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	List types of Inheritances.	Remember
2.	What is Abstraction in Java?	Understand
3.	Define base class and derived class.	Remember
4.	Define Interface, Package	Remember
5.	What is Method Overriding?	Understand

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain Packages.	Understand
2.	What is Inheritance? List and explain types of Inheritances.	Apply
3.	What are the rules to be followed while overriding a method?	Understand
4.	Explain the use of the super keyword.	Understand
5.	Explain how to implement Multiple Inheritances in Java through the Interface.	Understand

Essential Assignments

1. Explain Multilevel Inheritance with an example.

2. Explain the Interface in Java with an example.
3. Explain the super keyword with an example.
4. What is dynamic method dispatch in Java?
5. What is method overriding explain with an example?

Desirable Assignments

1. Write a Java program to demonstrate Multiple Inheritances using an Interface.
2. What is Interface? How it is different from class? With suitable program explain the use of Interface.
3. Create a base class Fruit that has name, taste, and size as its attributes. A method called eat() is created which describes the name of the fruit and its taste. Inherit the same in 2 other classes Apple and Orange and override the eat() method to represent each fruit taste.
4. Create a class to find out whether the given year is a leap year or not. (Use inheritance for this program)
5. Create a Java program to illustrate Dynamic Method Dispatch using hierarchical Inheritance.

Activities

1. Write a program to create an abstract class 'Animals' with two abstract methods 'cats' and 'dogs'. Now create a class 'Cats' with the method 'cats' which prints "Cat's meow" and a class 'Dogs' with the method 'dogs' which prints "Dogs bark", both inheriting the class 'Animals'. Now create an object for each of the subclasses and call their respective methods.

Learning Outcomes

- ❖ Understand concept of Inheritance and Method Overriding.
- ❖ To understand super and final keywords.
- ❖ Better understanding of Interface.
- ❖ Understand Package and how to importing Package and access rules of Package.

5 Exception Handling & Multithreaded Programming

Practical List

1. Write a program in Java to develop a user-defined Exception for the 'Divide by Zero' error.
2. Write a program to handle the Exception using Try and Multiple Catch blocks.
3. Write a program to demonstrate the life cycle of Thread

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	List types of Errors in Java.	Remember
2.	Define Thread. State two ways to create a Thread.	Remember
3.	What is a Runtime Error?	Understand
4.	What are the two limitations of Multithreading?	Understand
5.	What are the wait() and sleep() methods?	Understand
6.	List stages of Thread Life Cycle.	Remember
7.	List methods of Thread.	Remember

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Describe life cycle of Thread	Understand
2.	List types of Errors in Exceptional handling and explain any one of them.	Understand
3.	Explain the Thread pool.	Understand
4.	What are the two ways of implementing Thread in Java?	Understand
5.	What is use of Throw, Throws and Finally statement?	Understand

Essential Assignments

1. Explain ArrayIndexOutOfBound Exception in Java with an example.
2. What is a Runnable and Callable Interface? Write the difference between them.

3. What is Exception? How it is handled? Explain with suitable example.
4. Write a Java program to illustrate Multiple Catch blocks using a command line argument.
5. Draw State transition diagram of a Thread.

Desirable Assignments

1. Define an Exception called "NoMatchException" that is thrown when a string is not equal to "India". Write a Java Program that uses this exception.
2. Write a program in Java to demonstrate the use of synchronization of Threads when Multiple Threads are trying to update a common variable
3. Write a program to illustrate the Throws keyword in Java.
4. Write a program to create two threads so one thread will print 1 to 10 numbers whereas other will print 11 to 20 numbers.

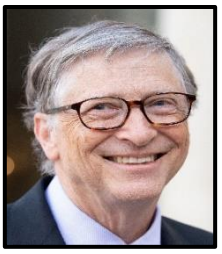
Activities

1. Write a program to create two Threads; one to print numbers in original order and other to reverse order from 1 to 50.

Learning Outcomes

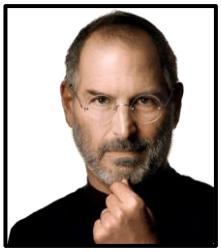
- Better understanding of types of Errors and Exception.
- Understand concept of Thread.

Quotes from Pioneers



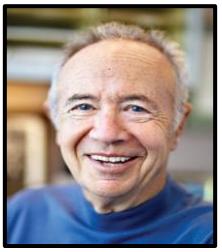
"The advance of technology is based on making it fit in so that you do not really even notice it, so it is part of everyday life."

- Bill Gates, Co-Founder, Microsoft.



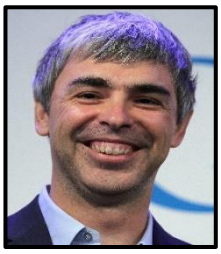
"Have the courage to follow your heart and intuition. They somehow already know what you truly want to become. Everything else is secondary."

- Steve Jobs, Co-Founder, Apple Inc.



"Success breeds complacency. Complacency breeds failure. Only the paranoid survives."

- Andy Grove, Former Chairman & CEO, Intel.

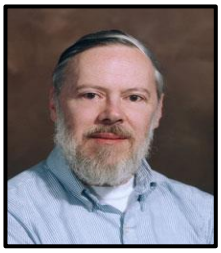


"If you are changing the world, you are working on important things. You're excited to get up in the morning."

- Larry Page, Co-Founder, Google & Alphabet Inc.

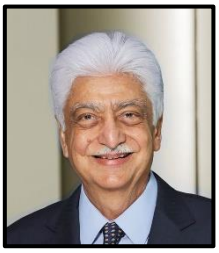
"Progress is often equal to the difference between mind and mindset."

- N. R. Narayana Murthy, Chairman Emeritus, Infosys.



"The only way to learn new programming language is by writing programs in it."

- Dennis Ritchie, Co-Creator of C Programming.



"Success is achieved twice. Once in the mind and the second time in the real world."

- Azim Premji, Founder Chairman, Wipro.

"The digital world has power because it has dynamic information, but it's important that we stay human instead of being another machine sitting in front of a machine."

- Pranav Mistry, President & CEO of STAR Labs.

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