Institute/ School Name	School of Engineering and Technology		
Department Name	Department of Computer Science & Engineering		
Program Name	Bachelor of Engineering (Computer Science & Engineering): B.E (CSE)		
Course Code	25CS021	Course Name	Java Programming
L-T-P (Per Week)	3-0-4	Course Credits	05
Academic Year	2025-26	Semester/Batch	5th /2023-27
Course Coordinator	Dr. Ashutosh Kumar Dubey		

1. Course Outline:

Introduction to Java, Java Basics, Control Statements, Working with Arrays, Classes and Objects, Inheritance, Abstract Methods & Classes, Packages & Interfaces, Strings, String Buffer, StringBuilder & String Tokenizer, Multithreading, Generics, Collections Framework, Exception Handling, IO Streams, JDBC connectivity.

2. Programme Outcomes (POs):

At the end of the programme, students will be able to achieve knowledge about the following:	
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Course Learning Outcomes (CLO):

After completing the course, the students will be able to:

CLO1: Understand the principles of Java input and output mechanisms to strengthen foundational programming skills.
CLO2: Apply object-oriented programming concepts and methodologies using Java to develop problem-solving and software design skills.
CLO3: Implement and analyze data structures using the Java collection framework to enhance algorithmic thinking and programming proficiency.
CLO4: Develop concurrent applications using multithreading in Java to improve employability in real-time systems development and multi-core programming environments.
CLO5: Apply exception handling mechanisms to build robust Java applications for better software development practices.

4. CLO-PO Mapping Matrix:

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO1	H	M		L	H							M
CLO2	H	H	H		M							
CLO3	L	M	H					M	M		H	M
CLO4		M	M	L					H	M		
CLO5	H	M	H		H				M	H	H	M

5. ERISE Grid Mapping:

Feature Enablement	Level (1-5, 5 being highest)
Entrepreneurship	1
Research/Innovation	1
Skills	5
Employability	4

6. Recommended Books (Reference Books/Text Books):

B01: Schildt, H. (9th Edition). Java: The complete reference. McGraw-Hill Education Group.
B02: Sierra, K., & Bates, B. (2nd Edition). Head First Java: A brain-friendly guide. O'Reilly Media.
B03: Finegan, E., & Liguori, R. (1st Edition). OCA Java SE 8: Guia de estudos para o exame 1Z0-808. Bookman Editora.
B04: Sierra, K., & Bates, B. (1st Edition). OCA/OCP Java SE 7 Programmer I & II study guide: Exams 1Z0-803 & 1Z0-804. McGraw-Hill Education Group.
B05: Goodrich, M. T., Tamassia, R., & Goldwasser, M. H. (5th Edition). Data structures and algorithms in Java. John Wiley & Sons.

7. Other readings and relevant websites:

Resources	Link of Journals, Magazines, Websites and Research Papers
R1	http://www.w3schools.com/java
R2	https://www.javatpoint.com.cach3.com/java-what-where-and-why.html
R3	https://www.tutorialspoint.com/java
R4	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
R5	https://www.geeksforgeeks.org/generic-constructors-and-interfaces-in-java/

Resources	Link of Audio-Video resources
V1	https://hp.chitkara.edu.in//listOnlineResources.php
V2	https://www.youtube.com/@DecodingComputers/videos
V3	https://www.youtube.com/@e-learningschitkarauniversi1078/videos
V4	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

* Resources uploaded on ERP system is accessible to all the students registered for the course.

8. Recommended Tools and Platforms:

- Coding Blocks, Visual Studio, Eclipse
- Online platform: https://testpad.chitkarauniversity.edu.in

9. Course Plan:

Lecture Number	Topics	Weightage in ETE (%)	Instructional Resources
1-2	Introduction to JAVA: Java Introduction, History and goals of Java, Fundamentals of OOPs.	10	B01, R2, V1
3-4	Overview of JDK, JVM, Garbage Collection.		
5-7	Revision of OOPs, C++ vs JAVA, Revision of Data Structure.		
8-10	Java Basics: Identifiers, Keywords, Java Data Types, Command Line Arguments.		
11-13	Java Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, Ternary operator, Bitwise Operators: Bitwise OR, Bitwise AND, Bitwise XOR, Bitwise Complement, Bit-Shift Operators.		
14-16	Control Statements: Decision Constructs, Using Loop Constructs	20	B01, B02, R1, V1
17-18	Revision of Array Data Structure - Basics, Java Arrays, Creating and Using Arrays		
19-20	Working with Arrays: 1D, 2D, Multidimensional Arrays, Arrays Class		
21-23	Classes & Objects: Classes, objects and methods: defining a class,		B01, R2, V1, V2
24-25	Practice Problems for classes and objects		
26-28	Access Control, Method overloading, Practice problems on parameter differentiation,		
29-31	Compile-time polymorphism, Default arguments, Variable-length arguments		
32-34	Constructors: Introduction, Default Constructor, Parameterized Constructor, No-argument Constructor, Multiple Constructors, Practice problems		
35-37	Constructors, Constructor overloading, (Overloading, Initialization, Overloaded Constructor, Different Parameter Lists, Compile-time Polymorphism) Use of this keyword	10	B01,B02, B04, R4 V2
38-40	Constructors: Current Object, Instance Variable, Constructor Call, Method Call, Current Class, Practise problems		
41-43	Constructors: Static Keyword, Static Variable Static Method, Static Block, Static Import)		
44-46	Inheritance: Working with Inheritance: Inheritance Basics using super, Method Overriding,	10	
47-49	Inheritance Types- Single Inheritance, Multilevel Inheritance, Hierarchical, Inheritance		
50-52	Interface-Based Multiple Inheritance Why Java Doesn't Support Multiple Inheritance with Classes (Diamond Problem)		

53-55	Inheritance: Using super Keyword, Method Overriding		
56-58	Dynamic method dispatch, final keyword. Practice Problems	10	
59-61	Modern Java Language Features: Lambda Expressions & Functional Interfaces, Annotations in Java		
62-64	Abstract Methods & Classes, Packages & Interfaces: Built-In Packages and User Defined Packages		
65-67	Interfaces: Declaration, Implementation, Extending Classes and Interfaces		
68-70	Interfaces: Examples and Practise problems		
71-73	Strings, StringBuffer, StringBuilder & StringTokenizer: Introduction, Immutable String	20	B01, B02, B05, R3, V1
74-76	Methods of String class, String Buffer class & String Builder class, to String method, String Tokenizer class. Practice Problems		
77-79	Exception Handling: Exception handling fundamentals, Exception types, try and catch, multiple catch clauses, nested try, throw, throws and finally		
80-81	Exception Handling: Creating custom Exception. Practice problems.		
82-84	Multithreading: Java thread model, main thread, creating thread by implementing Runnable and extending thread class, Practice Problems		
85-87	Multithreading: Creating multiple threads, using isAlive() and join(), thread priorities, Synchronization.		
88-90	Generics: Introduction, Generic Example, Generic Class, Generic Method Practise problems	05	B01, B03, R5, V3
91-92	Generics: Generic Constructor and Generic Interfaces. Practice Problems		
93-95	Collections Framework Overview:Introduction to Java Collections Framework (JCF), Key Interfaces: Collection, Iterable, Map. Importance of collections in Java. Basic Use Cases.	10	B01, B03, R5, V1
96-97	Collections Framework:List and Queue Interfaces with Implementations: List (ArrayList) basic methods and traversal. Use-case-driven comparison.		
98-100	Collections Framework: Set Interface and Implementations: Set, HashSet, LinkedHashSet, TreeSet. Comparison of characteristics (Ordering, Duplicates, Performance). Introduction to Map interface: HashMap, TreeMap, Linked HashMap.		
101-103	Iterators, and Comparators: Iteration using Iterator, ListIterator, and for-each. Use of Comparable and Comparator (for sorting collections)		
104-105	Collections Framework:Introduction, Collection Interfaces: Arrays, Vector, Practice Problems		

10. Industry Interventions:

- The students will receive resources on the LMS system, and their progress will be tracked on the platform based on their submissions (number of submissions, errors encountered, and optimized solutions).
- Industry Curated Module: https://testpad.chitkarauniversity.edu.in

11. Innovative Pedagogies:

- NA

12. Action plan for different types of learners

Slow Learners	Average Learners	Advanced Learners
Remedial Classes	Workshops / Practice Assignment*	Advanced Problems*

* The practice test will be assigned on the LMS platform for both average and advanced learners.

13. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment (Offline/ Online)
Internal Component	Sessional Tests (STs)	02*	40%	Online**
External Component	End Term Examination (ETE)	01	60%	Online**
Total		100%		

* Out of the two, the best 01 will be considered.
** Proctored examination will be conducted on Testpad platform.

14. Details of Evaluation Components:

Evaluation Component	Description	Syllabus Covered (%)	Timeline of Examination	Weightage(%)
Internal Component	ST 01	Up to 40 (Lectures 1-40)	Week 5	40
	ST 02	41 - 80 (Lectures 41-81)	Week 9	
External Component	End Term Examination*	100	As Notified by the Exam Cell	60
Total				100

* Minimum 75% attendance is required to become eligible for appearing in the End Term Examination

15. Format of Evaluation Components:

Type of Assessment	Total Marks	1 Mark MCQ	2 Marks MCQ	5 Marks Coding Question	10 Marks Coding Question
Sessional Tests	40	10	5	2	1
End Term Examination	60	10	10	4	1

16. Revision (if any):

Academic Year of Previous Version	2024-2025	Percentage of Revision	14%

Topics Added:

- Revision of OOPs, C++ vs JAVA, Revision of Data Structure
- Bitwise Operators: Bitwise OR, Bitwise AND, Bitwise XOR, Bitwise Complement, Bit-Shift Operators.
- Interface-Based Multiple Inheritance
- Why Java Doesn't Support Multiple Inheritance with Classes (Diamond Problem)
- Modern Java Language Features: Lambda Expressions & Functional Interfaces, Annotations in Java
- Importance of collections in Java. Basic Use Cases
- Comparison of characteristics (Ordering, Duplicates, Performance).
- Use of Comparable and Comparator (for sorting collections)

Topics Deleted:

- Jagged Arrays
- Queue (Priority Queue, LinkedList as Queue),
- Stack
- IO Streams: Stream Classes: Byte Streams, Character Streams Practice Problems
- JDBC Connectivity: Introduction, Architecture of JDBC Database Connection.

17. This Document is:

Designation	Name	Signature
Prepared by Course Coordinator	Dr. Ashutosh Kumar Dubey	
Verified by Assistant Dean	Dr. Ashutosh Kumar Dubey | Ms. Ravita Chahar	
Approved by Pro VC	Prof. (Dr.) Meenu Khurana	
Date	23rd June 2025	