



## School of Computer Science and Engineering Dept. of Computer Science and Engineering COURSE PLAN Academic Year 2025-26 EVEN SEMESTER

<b>School/Department of Students</b>	<b>PSCS</b>
<b>Name of the Program(s) of Students</b>	B.Tech. Computer Science and Engineering (CSE), B.Tech. in Information Science and technology – IST, B.Tech. in Computer Science and Engineering (Networks) – CSN, B.Tech. in Computer Science and Information Technology – CSI, B.Tech. in Computer Engineering– COM
<b>PRC Approval Ref. No.</b>	<b>PU/AC-24.05/SOCSE04/CSE/2024-2028</b>
<b>Semester/Year</b>	<b>IV/II</b>
<b>Course Code &amp; Name</b>	<b>CSE2504 &amp; Scalable Application Development using Java Lab</b>
<b>Credit Structure (L-T-P-C)</b>	<b>0-0-2-1</b>
<b>Contact Hours</b>	2 Sessions per week -30Sessions
<b>Course In-Charge (IC)</b>	<b>Ms. Impa B H, Dr. Afroz Pasha, Dr. Joseph Michael Jerard</b>
<b>Course Instructor(s)</b>	<b>Ms. Chinmayi G V, Dr. Joseph Michael Jerard V, Ms. Uma Sankari, Mr. Prajeesh C B, Ms. Delsy Jyothi, Ms. Anu Joseph, Ms. Nayana R, Mr. Aadil Ferrooz, Ms. Swetha K H, Dr. Aarif Ahamed, Mr. Selva Ganesh R, Mr. Sai Kumar, Ms. Sumana Datta, Mr. Libin Jacob, Mr. Sreehari T M, Dr. Raja Jitendra Nayak, Mr. Laxman, Mr. Sunil Kumar Sahoo, Dr. Ramesh Babu K, Ms. Sumita Guddin, Ms. Impa B H Dr. Afroz Pasha</b>
<b>Course URL</b>	<b><a href="https://presidencyuniversity.linways.com">https://presidencyuniversity.linways.com</a></b>

### 1. COURSE PRE-REQUISITES:

Problem Solving Using Java (CSE1001)

### 2. COURSE DESCRIPTION:

The purpose of this course is to provide students with an in-depth understanding of advanced concepts and techniques in Java development. The course is both conceptual and analytical and is understood with JDK 21 software & Eclipse IDE. This course involves essential core java concepts

like multithreading, file handling, annotations, generics, lambda expressions etc. This course also develops critical thinking skills by augmenting the student's ability to develop web application for various modern management systems like banking management system, student information management system, , Library Management System etc. with the necessary API for communication with database.

### **3. COURSE OBJECTIVES:**

The objective of the course is to familiarize the learners with the concepts of Scalable Application Development using Java and attain **Employability Skills** through **Experiential techniques**.

### **4. COURSE OUTCOMES:**

**TABLE 1: COURSE OUTCOMES**

CO Number	Statement of CO	Blooms Cognitive Level
	<i>On successful completion of the course the students shall be able to</i>	
CO1	Demonstrate Concurrent Programming using Java Multi-Threading	Apply
CO2	Practice the access mechanism to read/write file systems using Java I/O Operations.	Apply
CO3	Apply Java Collections Framework and JDBC techniques to design and develop data-driven applications.	Apply
CO4	Implement Generics, Annotations & Lambda expressions using Java Programs.	Apply
CO5	Develop web application using Servlet & JSP.	Apply

### **5. MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

#### **5.1 PROGRAM OUTCOMES:**

On successful completion of the Program, the students will be able to:

- PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. 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.

- PO3. 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.
- PO4. 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.
- PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6. 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.
- PO7. 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.
- PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. Individual and team work: 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.

**TABLE 2a: CO-PO Mapping**

CO. No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	H	-	-	-	M	L	-	M
CO2	H	M	M	M	H	-	-	-	-	L	-	M
CO3	H	H	H	M	H	L	-	-	M	L	M	M
CO4	H	M	H	-	H	-	-	-	-	L	-	M

<b>CO5</b>	H	H	H	M	H	M	L	L	M	M	M	M
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## 5.2 PROGRAM SPECIFIC OUTCOMES:

### 5.3 PROGRAM SPECIFIC OUTCOMES:

6. On successful completion of B.Tech. in Computer Science and Engineering - **CSE** Program the students will be able to:

<b>PSO1</b>	[Problem Analysis]: Identify, formulate, research literature, and analyze complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PSO2</b>	[Design/development of Solutions]: Design solutions for complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies 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.
<b>PSO3</b>	[Modern Tool usage]: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities related to Data Science principles and practices, Programming and Computing technologies with an understanding of the limitations.

<b>CO Number</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	H	M	M
<b>CO2</b>	H	M	M
<b>CO3</b>	H	H	M
<b>CO4</b>	H	M	M
<b>CO5</b>	M	H	M

On successful completion of B.Tech. in Information Science and technology - **IST** Program the students will be able to:

<b>PSO1</b>	Exhibit a solid grasp of information science fundamentals to explain core concepts, analyze computational challenges using theoretical knowledge, and design and develop reliable, efficient systems and applications
<b>PSO2</b>	Combine software development practices, programming skills and information science domain knowledge to create practical, real-world applications, preparing them for a range of career opportunities in software development, advanced studies, research, or entrepreneurial ventures
<b>PSO3</b>	Create, deploy, and supervise robust data systems that maintain consistency, integrity, and availability, while performing analysis as well as audits to ensure compliance, detect anomalies, uphold accountability through sound data management, administration, and risk assessment practices

<b>CO Number</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
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<b>CO1</b>	H	M	M
<b>CO2</b>	H	M	M
<b>CO3</b>	H	H	M
<b>CO4</b>	H	M	M
<b>CO5</b>	H	H	M

On successful completion of B.Tech. in Computer Science and Engineering (Networks) – **CSN** Program the students will be able to:

<b>PSO1</b>	Employ a solid understanding of computer science fundamentals to clarify key concepts, analyse computational problems based on theoretical knowledge, and build reliable and optimized computing systems
<b>PSO2</b>	Combine programming skills, software development tools, and knowledge of computer networks to create practical, real-world applications, preparing for diverse career opportunities in software development, higher education, research, or entrepreneurial ventures
<b>PSO3</b>	Use networking tools and technologies to solve real-world problems and demonstrate readiness for careers in network administration, cybersecurity, cloud computing, and telecommunications.

<b>CO Number</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	H	M	M
<b>CO2</b>	H	M	M
<b>CO3</b>	H	M	M
<b>CO4</b>	H	M	M
<b>CO5</b>	M	M	M

On successful completion of B.Tech. in Computer Science and Information Technology –**CSI** Program the students will be able to:

<b>PSO1</b>	Explain key concepts with a strong understanding of computer science fundamentals, analyse computational problems using theoretical knowledge, and develop reliable and optimized computing systems.
<b>PSO2</b>	Use programming skills, software development practices, and expertise in information technology to create practical, real-world applications that prepare students for diverse opportunities in software development, higher education, research, or entrepreneurial pursuits.
<b>PSO3</b>	Design, implement, and manage robust data systems that ensure data consistency, integrity, and availability through effective data management and data administration practices.

<b>CO Number</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	H	H	M
<b>CO2</b>	H	H	M
<b>CO3</b>	H	H	M
<b>CO4</b>	H	H	M
<b>CO5</b>	H	H	M

On successful completion of B.Tech. in Computer Engineering– **COM** Program the students will be able to:

<b>PSO1</b>	Explain key concepts with a strong understanding of computer science fundamentals, analyse computational problems using theoretical knowledge, and develop reliable and optimized computing systems.
<b>PSO2</b>	Use programming skills, software development practices, and expertise in information technology to create practical, real-world applications that prepare students for diverse opportunities in software development, higher education, research, or entrepreneurial pursuits.
<b>PSO3</b>	Design, implement, and manage robust data systems that ensure data consistency, integrity, and availability through effective data management and data administration practices.

<b>CO Number</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	H	H	M
<b>CO2</b>	H	H	M
<b>CO3</b>	H	H	M
<b>CO4</b>	H	H	M
<b>CO5</b>	H	H	M

## 7. DETAILS OF THE EXPERIMENTS/PRACTICAL SESSIONS:

Sl.No	List Of Experiments	Number of Sessions

1	<p><b>Lab Sheet-1</b></p> <p>With the help of Multithreading concept, create two separate threads, one thread titled "<b>primeThread</b>" by extending the Thread class, and the other titled "<b>fiboThread</b>" by implementing Runnable interface."primeThread" will be responsible to print all the prime numbers from 1 to 100 in a regular interval of 0.25 seconds. "fiboThread" will be responsible to print fibonacci series of 20 numbers, in a regular interval of 0.5 seconds.</p> <p>On executing this application, get the following info also.</p> <ul style="list-style-type: none"> <li>i)Get the <b>id, name and priority</b> of the main thread</li> <li>ii)Change the name and priority of the main thread and print the same.</li> <li>iii)Print the thread group info of both the child threads</li> <li>iv) Use <b>isAlive</b> method to check the status of the childThread.</li> </ul>	1
2	<p><b>Lab Sheet-2</b></p> <p>Presidency University is organizing an event. While each participant arrives, get the name of the participant and assign participant IDs to each participant starting from 101, and should be following with sequence of ID for the further participants. Presidency has created a String array that has the following info.</p> <p>{“Hi”, “name of the participant”, “ID of the participant”, “Welcome Message”}. The registration team register the Participant details. You can create a class “Participant” with participantId, participantName as members. Create a setter method to set the participant details. Once the participants are registered, the welcome message is printed by separate Threads on Participant instance. Write a java program to handle this scenario.</p>	1
3	<p><b>Lab Sheet-3</b></p> <p>In a bank system, a shared bank account is accessed by two threads: <b>Deposit Thread (Producer)</b>: Deposits money into the account.<b>Withdrawal Thread (Consumer)</b>: Withdraws money from the account.The withdrawal operation should be performed <b>only when sufficient balance is available</b>. If the balance is insufficient, the withdrawal thread must <b>wait</b> until the deposit thread deposits money. Use <b>inter-thread communication</b> (wait() and notify()) to implement this scenario.</p>	1
4	<p><b>Lab Sheet-4</b></p> <p>Develop a Java program to perform the following operations with text files.</p> <ul style="list-style-type: none"> <li>a)Create a folder , student name as folder name in c drive by passing the folder name at run time using Scanner.</li> <li>b)Create a file to write an essay “short notes on multithreading”, file name must be “multithread.txt”.</li> <li>c)Read the content of the file to output console.</li> <li>d)Copy the content of above file to another file multithread_copy.txt.</li> </ul>	1

5	<p><b>Lab Sheet-5</b></p> <p>Demonstrate a Java program to perform the following operations with binary files.</p> <p>a) Create a folder , section name as folder name in c drive by passing the folder name at run time using Scanner.</p> <p>b) Create a file to write about students those who submitted above essay , file name must be “students.dat”.</p> <p>c) Add the content to the above file as follows: The first line is the header line, the remaining lines corresponds to rows in the table,</p> <p>d) The elements are separated by spaces.</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Name</th><th>Regdno</th><th>Essaysubmitted</th></tr> </thead> <tbody> <tr> <td>Arun</td><td>123</td><td>yes</td></tr> <tr> <td>Aditi</td><td>124</td><td>yes</td></tr> <tr> <td>Remaesh</td><td>126</td><td>No</td></tr> </tbody> </table> <p>e) Read the above file to console.</p>	Name	Regdno	Essaysubmitted	Arun	123	yes	Aditi	124	yes	Remaesh	126	No	1
Name	Regdno	Essaysubmitted												
Arun	123	yes												
Aditi	124	yes												
Remaesh	126	No												
6	<p><b>Lab Sheet-6</b></p> <p>In a <b>college student management system</b>, student details must be stored permanently so that the information is not lost when the application is closed.Demonstrate how a <b>Student object</b> can be <b>serialized</b> and stored in a file named <b>student.ser</b>, and later <b>deserialized</b> to retrieve and display the student details when the system restarts.</p>	1												
7	<p><b>. Lab Sheet-7</b></p> <p>Design and implement a Java program to <b>demonstrate the Collection Framework</b> by performing the following operations on <b>student records</b> containing <b>ID, Name, Fee, Age, Semester, and College</b>:</p> <p>a) Store multiple student objects using the <b>Collection</b> interface.</p> <p>b) Traverse and display student details using the <b>Iterator</b>.</p> <p>c) Sort the student records based on different attributes such as <b>ID, Name, Fee, Age, Semester, and College Name</b> using the <b>Comparator</b> interface.</p> <p>Demonstrate sorting by at least <b>three different attributes</b> and display the output for each case.</p>	1												
8	<p><b>Lab Sheet-8</b></p> <p>Develop a Java application using <b>MySQL and JDBC</b> to manage an <b>EmployeeDatabase</b>.</p> <p>Create a database <b>employeedb</b> and an <b>employee</b> table, demonstrate <b>JDBC connection steps</b>, and perform <b>insert, update, select, and delete</b> operations on the employee records.</p>	1												

9	<p><b>Lab Sheet-9</b></p> <p>Mr. Kevin working as a cashier in ABC Retail Mart. You help him to generate bill of each item's total price. Initially they stored all the products list in mysql database. Write a Java program to update total price of each item in mysql table and retrieve each product with total price and bill amount of a particular customer (ex. Cust1) from mysql using JDBC PreparedStatement.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Cust_ID</th><th>Product_ID</th><th>Product_Name</th><th>Qty</th><th>Price</th></tr> </thead> <tbody> <tr> <td>Cust1</td><td>123</td><td>Product123</td><td>3</td><td>28.50</td></tr> <tr> <td>Cust1</td><td>121</td><td>Product121</td><td>4</td><td>145.00</td></tr> <tr> <td>Cust1</td><td>122</td><td>Product122</td><td>5</td><td>45.50</td></tr> <tr> <td>Cust2</td><td>121</td><td>Product121</td><td>2</td><td>145.00</td></tr> <tr> <td>Cust2</td><td>123</td><td>Product123</td><td>6</td><td>28.50</td></tr> </tbody> </table>	Cust_ID	Product_ID	Product_Name	Qty	Price	Cust1	123	Product123	3	28.50	Cust1	121	Product121	4	145.00	Cust1	122	Product122	5	45.50	Cust2	121	Product121	2	145.00	Cust2	123	Product123	6	28.50	1
Cust_ID	Product_ID	Product_Name	Qty	Price																												
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Cust1	122	Product122	5	45.50																												
Cust2	121	Product121	2	145.00																												
Cust2	123	Product123	6	28.50																												
10	<p><b>Lab Sheet-10</b></p> <p>In a <b>college examination management system</b>, student marks may be recorded in different numeric formats such as <b>Integer</b>, <b>Float</b>, or <b>Double</b> depending on the evaluation scheme. Design and implement a <b>generic Java class</b> to store and process student marks of different numeric types, ensuring <b>type safety</b> and <b>eliminating the need for explicit type casting</b>.</p>	1																														
11	<p><b>Lab Sheet-11</b></p> <p>Design and implement a <b>Java console application</b> to demonstrate the use of the <b>Collection Framework</b> on <b>Student data</b>. Access and process the collection using <b>Lambda Expressions</b>, and perform <b>sorting of student records</b> using the <b>Comparator interface</b> implemented through lambda expressions.</p>	1																														
12	<p><b>Lab Sheet-12</b></p> <p>In a <b>college web portal</b>, users must log in to access internal resources such as notices and profile information. For initial testing, the administrator wants to validate user credentials <b>without using a database</b>. Design and implement a <b>Java Servlet</b> that:</p> <ul style="list-style-type: none"> <li>• Accepts <b>username and password</b> from a login form,</li> <li>• Validates the credentials using <b>predefined (hardcoded) values</b>, and</li> <li>• Displays an appropriate <b>success or failure message</b> based on the login result.</li> </ul> <p>Demonstrate the solution using a <b>Servlet and an HTML login page</b>.</p>	1																														
13	<p><b>Lab Sheet-13</b></p> <p>Design a <b>Java Servlet</b> for a <b>Student Information Management System</b> that accepts student details from a web form, <b>inserts the data into a MySQL database using JDBC</b>, and uses <b>RequestDispatcher</b> to display a success or failure message.</p>	1																														

**REFERENCE MATERIALS:****Text Books:**

- T1.Herbert Schildt, “Java 2: The Complete Reference”, Tata McGraw-Hill Education, 12th Edition,2021.
- T2. Jim Keogh, “J2EE: The Complete Reference”. Tata McGraw-Hill Education, 2018.

**Reference Books:**

- R1: Y.Daniel Liang, “Introduction to Java programming Comprehensive Version”, Pearson Education, 10th Edition, 2018.
- R2: Cay S Horstmann and Gary Cornell, “CORE JAVA volume II-Advanced Features, 9th Edition,2016.
- R3: Core and Advanced Java Black Book, Dream Tech Press.

**Online Resources**

1. <https://docs.spring.io/spring-framework/reference/core.html>
2. <https://docs.oracle.com/javaee/7/api/javax/servlet/Servlet.html>
3. <https://docs.oracle.com/javaee/5/tutorial/doc/bnajo.html>
4. <https://docs.oracle.com/javase/tutorial/jdbc/basics/index.html>

**8. TEACHING AND LEARNING SCHEME:**

Course Code	Course Title	Teaching and Learning Scheme					
		Class Room Instruction (CI) (in hour per semester)		Lab Instruction (LI) (in hour per semester)		Term work (TW) and Self Learning (SL) (TW+SL) (in hour per semester)	Total Number of hours per semester
		L	T	P	(TW=, SL=)		
CSE2504	Scalable Application Development using Java Lab	0	0	30	0	30	=30/30=1

**Practical/Laboratory Resources:**

1. Scalable Application Development using Java Laboratory Manual, Presidency University, Bengaluru.

**9. DETAILED SCHEDULE OF INSTRUCTION**

Sl.No	List Of Experiments	CO number
<b>1</b>	Program Integration & Course Integration Overview of the Course, Scope and Opportunities	-
<b>2</b>	<p><b>Lab Sheet-1: Multithreading in Java and Threads Creation</b></p> <p>With the help of Multithreading concept, create two separate threads, one thread titled "<b>primeThread</b>" by extending the Thread class, and the other titled "<b>fiboThread</b>" by implementing Runnable interface."primeThread" will be responsible to print all the prime numbers from 1 to 100 in a regular interval of 0.25 seconds. "fiboThread" will be responsible to print fibonacci series of 20 numbers, in a regular interval of 0.5 seconds.</p> <p>On executing this application, get the following info also.</p> <ul style="list-style-type: none"> <li>i)Get the <b>id, name and priority</b> of the main thread</li> <li>ii)Change the name and priority of the main thread and print the same.</li> <li>iii)Print the thread group info of both the child threads</li> <li>iv) Use <b>isAlive</b> method to check the status of the childThread.</li> </ul>	CO1
<b>3</b>	<p><b>Lab Sheet-2: Synchronization</b></p> <p>Presidency University is organizing an event. While each participant arrives, get the name of the participant and assign participant IDs to each participant starting from 101, and should be following with sequence of ID for the further participants. Presidency has created a String array that has the following info.</p> <p>{“Hi”, “name of the participant”, “ID of the participant”, “Welcome Message”}. The registration team register the Participant details. You can create a class “Participant” with participantId, participantName as members. Create a setter method to set the participant details. Once the participants are registered, the welcome message is printed by separate Threads on Participant instance. Write a java program to handle this scenario.</p>	CO1

4	<p><b>Lab Sheet-3: Inter Thread Communication</b></p> <p>In a bank system, a shared bank account is accessed by two threads: <b>Deposit Thread (Producer)</b>: Deposits money into the account. <b>Withdrawal Thread (Consumer)</b>: Withdraws money from the account. The withdrawal operation should be performed <b>only when sufficient balance is available</b>. If the balance is insufficient, the withdrawal thread must <b>wait</b> until the deposit thread deposits money. Use <b>inter-thread communication</b> (wait() and notify()) to implement this scenario.</p>	CO1												
5	<p><b>Lab Sheet-4: File Operations</b></p> <p>Develop a Java program to perform the following operations with text files.</p> <ul style="list-style-type: none"> <li>a) Create a folder , student name as folder name in c drive by passing the folder name at run time using Scanner.</li> <li>b) Create a file to write an essay “short notes on multithreading”, file name must be “multithread.txt”.</li> <li>c) Read the content of the file to output console.</li> <li>d) Copy the content of above file to another file multithread_copy.txt.</li> </ul>	CO2												
6	<p><b>Lab Sheet-5: IO Stream Operations</b></p> <p>Demonstrate a Java program to perform the following operations with binary files.</p> <ul style="list-style-type: none"> <li>a) Create a folder , section name as folder name in c drive by passing the folder name at run time using Scanner.</li> <li>b) Create a file to write about students those who submitted above essay , file name must <b>be</b> “students.dat”.</li> <li>c) Add the content to the above file as follows: The first line is the header line, the remaining lines corresponds to rows in the table,</li> <li>d) The elements are separated by spaces.</li> </ul> <table border="0" data-bbox="504 1253 1002 1381"> <thead> <tr> <th>Name</th> <th>Regdno</th> <th>Essaysubmitted</th> </tr> </thead> <tbody> <tr> <td>Arun</td> <td>123</td> <td>yes</td> </tr> <tr> <td>Aditi</td> <td>124</td> <td>yes</td> </tr> <tr> <td>Remaesh</td> <td>126</td> <td>No</td> </tr> </tbody> </table> <p>e) Read the above file to console.</p>	Name	Regdno	Essaysubmitted	Arun	123	yes	Aditi	124	yes	Remaesh	126	No	CO2
Name	Regdno	Essaysubmitted												
Arun	123	yes												
Aditi	124	yes												
Remaesh	126	No												
7	<p><b>Lab Sheet-6: Serialization and DeSerialization</b></p> <p>In a <b>college student management system</b>, student details must be stored permanently so that the information is not lost when the application is closed. Demonstrate how a <b>Student object</b> can be <b>serialized</b> and stored in a file named <b>student.ser</b>, and later <b>deserialized</b> to retrieve and display the student details when the system restarts.</p>	CO2												

8	<p><b>. Lab Sheet-7: Comparator Interface</b></p> <p>Design and implement a Java program to <b>demonstrate the Collection Framework</b> by performing the following operations on <b>student records</b> containing <b>ID, Name, Fee, Age, Semester, and College</b>:</p> <p>a) Store multiple student objects using the <b>Collection</b> interface.</p> <p>b) Traverse and display student details using the <b>Iterator</b>.</p> <p>c) Sort the student records based on different attributes such as <b>ID, Name, Fee, Age, Semester, and College Name</b> using the <b>Comparator</b> interface.</p> <p>Demonstrate sorting by at least <b>three different attributes</b> and display the output for each case.</p>	CO3																														
9	<p><b>Lab Sheet-8: CRUD Operations using JDBC and Mysql</b></p> <p>Develop a Java application using <b>MySQL and JDBC</b> to manage an <b>EmployeeDatabase</b>.</p> <p>Create a database <b>employeedb</b> and an <b>employee</b> table, demonstrate <b>JDBC connection steps</b>, and perform <b>insert, update, select, and delete</b> operations on the employee records.</p>	CO3																														
10	<p><b>Lab Sheet-9: Prepared Statement</b></p> <p>Mr. Kevin working as a cashier in ABC Retail Mart. You help him to generate bill of each item's total price. Initially they stored all the products list in mysql database. Write a Java program to update total price of each item in mysql table and retrieve each product with total price and bill amount of a particular customer (ex. Cust1) from mysql using JDBC PreparedStatement.</p> <table border="1" data-bbox="319 1215 1235 1462"> <thead> <tr> <th>Cust_ID</th><th>Product_ID</th><th>Product_Name</th><th>Qty</th><th>Price</th></tr> </thead> <tbody> <tr> <td>Cust1</td><td>123</td><td>Product123</td><td>3</td><td>28.50</td></tr> <tr> <td>Cust1</td><td>121</td><td>Product121</td><td>4</td><td>145.00</td></tr> <tr> <td>Cust1</td><td>122</td><td>Product122</td><td>5</td><td>45.50</td></tr> <tr> <td>Cust2</td><td>121</td><td>Product121</td><td>2</td><td>145.00</td></tr> <tr> <td>Cust2</td><td>123</td><td>Product123</td><td>6</td><td>28.50</td></tr> </tbody> </table>	Cust_ID	Product_ID	Product_Name	Qty	Price	Cust1	123	Product123	3	28.50	Cust1	121	Product121	4	145.00	Cust1	122	Product122	5	45.50	Cust2	121	Product121	2	145.00	Cust2	123	Product123	6	28.50	CO3
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11	<p><b>Lab Sheet-10 : Java Generics</b></p> <p>In a <b>college examination management system</b>, student marks may be recorded in different numeric formats such as <b>Integer, Float, or Double</b> depending on the evaluation scheme. Design and implement a <b>generic Java class</b> to store and process student marks of different numeric types, ensuring <b>type safety</b> and <b>eliminating the need for explicit type casting</b>.</p>	CO4																														
12	<p><b>Lab Sheet-11: Lambda Expressions</b></p> <p>Design and implement a <b>Java console application</b> to demonstrate the use of the <b>Collection Framework</b> on <b>Student data</b>. Access and process the collection using <b>Lambda Expressions</b>, and perform <b>sorting of student records</b> using the <b>Comparator interface</b> implemented through lambda expressions.</p>	CO4																														

13	<p><b>Lab Sheet-12: Web Application using Servlet</b></p> <p>In a <b>college web portal</b>, users must log in to access internal resources such as notices and profile information.</p> <p>For initial testing, the administrator wants to validate user credentials <b>without using a database</b>.</p> <p>Design and implement a <b>Java Servlet</b> that:</p> <ul style="list-style-type: none"> <li>• Accepts <b>username and password</b> from a login form,</li> <li>• Validates the credentials using <b>predefined (hardcoded) values</b>, and</li> <li>• Displays an appropriate <b>success or failure message</b> based on the login result.</li> </ul> <p>Demonstrate the solution using a <b>Servlet and an HTML login page</b>.</p>	CO5
14	<p><b>Lab Sheet-13: Servlet with JDBC</b></p> <p>Design a <b>Java Servlet</b> for a <b>Student Information Management System</b> that accepts student details from a web form, <b>inserts the data into a MySQL database using JDBC</b>, and uses <b>RequestDispatcher</b> to display a success or failure message.</p>	CO5
15	<p><b>Mini Project Review and Quiz</b></p>	CO1,CO2, CO3,CO4, CO5

## 10. ASSESSMENT SCHEDULE

TABLE 4: ASSESSMENT SCHEDULE						
Sl. No	Assessment Type	Coverage	CO Number(s)	Duration in Minutes	Marks	Weightage
1	Continuous Assessment-1	Lab Sheet 1-6	CO1, CO2	90	20	10%
2	Mid term	Lab Sheet 1-9	CO1, CO2, CO3	90	50	25%
3	Continuous Assessment-2	Lab Sheet 10-13	CO4, CO5	90	20	10%
4	Quiz	Lab Sheet 14 and 15	CO1, CO2, CO3, CO4, CO5	20	10	5%
5	Continuous Assessment-3 (Observation+Record )	Lab Sheet 1-15	CO1, CO2, CO3, CO4, CO5	-	30	15%
3	Mini Project	Case Study	CO1, CO2, CO3, CO4, CO5	-	20	10%
5	End term examination	All Lab Sheet programs	CO1, CO2, CO3, CO4, CO5	100	50	25%

**11 .COURSE CLEARANCE CRITERIA:**

This is in accordance with the Academic Regulations of the University and the Program Regulations and Curriculum of the respective program.

**12. MAPPING WITH SUSTAINABLE DEVELOPMENT GOALS (SDGs):****TABLE 7: SDG MAPPING**

S. No	Topic	SDG Number	Justification
1	CRUD operation Using JDBC	<b>SDG 9</b> Industry, Innovation, and Infrastructure	JDBC skills are fundamental for building robust, scalable database-driven applications, which form the backbone of modern digital infrastructure and innovation across industries.
2	Handling Simple Servlet Program to fetch database records.	<b>SDG 12</b> Responsible Consumption and Production	Optimized servlet code reduces CPU cycles and memory usage, directly lowering the energy consumption of data centers and promoting more responsible use of digital resources.

**13.CRITERIA FOR COURSE OUTCOME ATTAINMENT CALCULATION:****TABLE 8: Threshold and Target Set for Course Outcomes**

Sl. No	C.O. No.	Course Outcomes	Threshold in %	Target in %
1.	CO1	Apply Concurrent Programming using Java Multi-Threading.	60	65
2.	CO2	Practice the access mechanism to read/write file systems using Java I/O Operations.	60	65
3.	CO3	Apply Java Collections Framework and JDBC techniques to design and develop data-driven applications.	55	60
4.	CO4	Implement Generics, Annotations & Lambda expressions using Java Programs	60	65
5.	CO5	Develop & Test Web application using Servlet & JSP.	60	65

## **14. SUMMARY**

<b>TABLE 9: SUMMARY OF COURSE SCHEDULE</b>				
<b>Sl. No.</b>	<b>Activity</b>	<b>Start date</b>	<b>End date</b>	<b>Total number of Sessions</b>
1	Overview of the course	07.01.2026	07.01.2026	-
2	Lab Sheet 01-03	08.01.2026	27.01.2026	3
3	Lab Sheet 04-06	28.01.2026	20.02.2026	3
4	Continuous Assessment 1	23.02.2026	28.02.2026	1
5	Lab Sheet 07-08	02.03.2026	20.03.2026	2
6	Midterm	23.03.2026	28.03.2026	1
7	Lab Sheet 09-13	30.03.2026	06.05.2026	4
8	Continuous Assessment 2	20.04.2026	24.04.2026	1
9	Mini Project Review and Quiz	30.03.2026	13.04.2026	2
10	Continuous Assessment 2	27.04.2026	06.05.2026	1
11	End Term	07.05.2026	30.05.2026	-

## **13. CONTACT TIMINGS IN THE CHAMBER FOR DISCUSSION**

Students can meet the respective course instructor during the Chamber Consultation Hour to clarify doubts related to the course.

## **14. SPECIFIC GUIDELINES TO STUDENTS, IF ANY:**

- Attend all classes regularly.
- Bring a scientific calculator to every class.
- Refer to online study materials and watch the suggested videos available on the NPTEL website.

Name and Signature of the course In-Charge

## **APPROVAL:**

This course has been duly verified and approved by the Departmental Academic Committee (DAC).

Name and Signature of the Chairperson - DAC