Course Code & Name	26CAPC8001 Advanced Java Programming		
Teaching Hours /week (L: T:P: R)	3:1:0:0	Credits	4
CIE Marks	40	ESE Marks	60
Course Type	Theory (PCC)	Exam Hours	3
Prerequisites (if any)	-		

Course Objectives:

1. To provide an in-depth understanding of advanced Java concepts for developing dynamic and enterprise-level applications using multithreading, networking, JDBC, Servlets, JSP, and Spring.
2. To enable students to design and implement multi-tier web applications, network programs, concurrent processes, database operations, and user interfaces using Java EE technologies.
3. To introduce the Spring Framework for building scalable and maintainable enterprise applications using dependency injection, Spring MVC, and RESTful web services.

Course Outcomes (COs)

At the end of the course students should be able to:

CO#	Course Outcomes	Bloom's Knowledge Level (KL)
CO 1	To explore multithreading, socket programming, and servlet concepts for developing dynamic, interactive, and network-based web applications.	K2
CO 2	To learn JSP architecture, scripting elements, EL, JSTL, and MVC design to build modular and maintainable web applications.	K3
CO 3	To understand JDBC architecture, drivers, SQL execution, transaction handling, and database integration for dynamic data management.	K4
CO 4	To gain foundational knowledge of the Spring Framework, including IoC, DI, Spring JDBC, Spring MVC, and RESTful services for enterprise application development.	K4

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	2	2	-	-	-	2
CO 2	3	3	2	2	-	-	-	1
CO 3	3	3	3	2	1	-	-	1
CO 4	3	3	3	3	2	1	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation*

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE)

Attendance	Assignment/ Micro-project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
8	**12**	**10**	**10**	**40 Marks**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

PART A	PART B	TOTAL
■ 2 Questions from each module. ■ Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	■ Each question carries 9 marks. ■ Two questions will be given from each module, out of which 1 question should be answered. ■ Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60 Marks**

SYLLABUS

Module #	Syllabus Description	Hours
1	**Multithreading, Networking, and Servlets:** Multithreading concepts; thread lifecycle; creating and managing threads; thread priorities and synchronization; inter-thread communication; networking basics – IP address, ports, sockets; client-server communication using socket programming. Servlet architecture and lifecycle, GenericServlet and HttpServlet classes, handling requests and responses using doGet() and doPost() methods, session management using cookies, URL rewriting, and HttpSession, request dispatching, filters, event listeners, database connectivity using JDBC within servlets, and development of dynamic and interactive web applications.	11
2	**JSP, EL, JSTL, and MVC-based Web Development:** JSP architecture and lifecycle, implicit objects such as request, response, session, and application, JSP scripting elements including declarations, expressions, and scriptlets, directives and action tags, Expression Language (EL), JSP Standard Tag Library (JSTL), Model-View-Controller (MVC) pattern using JSP as the view component, and database integration through JSP for building modular and maintainable web applications.	12
3	**JDBC Architecture, SQL Execution, and Database Integration:** JDBC architecture and components, types of JDBC drivers, establishing database connections using MySQL, executing SQL queries using Statement, PreparedStatement, and CallableStatement, handling ResultSet and ResultSetMetaData, transaction management and batch processing, exception handling in database applications, and integration of JDBC in web and enterprise applications for dynamic data management.	10
4	**Spring Framework, Spring MVC, Spring JDBC, and Spring Boot:** Introduction to the Spring Framework, concepts of	12

	Inversion of Control (IoC) and Dependency Injection (DI), Spring configuration using XML and annotations, Spring Core container and bean management, Spring JDBC for database operations, Spring MVC architecture and controllers, introduction to Spring Boot, RESTful web services using Spring, and case studies on enterprise application development using the Spring ecosystem.	

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition & Year**
1	Java: The Complete Reference	Herbert Schildt	McGraw Hill Education	12th Edition, 2022
2	Servlets and JSP: A Tutorial	Budi Kurniawan	Brainy Software	2nd Edition, 2019
3	Head First Servlets and JSP	Kathy Sierra and Bert Bates	O'Reilly Media	2nd Edition, 2019
4	Spring in Action,	Craig Walls	Manning Publications	7th Edition, , 2023.

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition & Year**
1	*J2EE: The Complete Reference*.	James Keogh	McGraw Hill Education	2017
2	*Core Servlets and Java Server Pages*	Marty Hall and Larry Brown	Pearson Education	3rd Edition, 2016
3	*Java Server Pages*	Hans Bergsten	O'Reilly Media	3rd Edition, 2017
4	*Professional Java Development with the Spring Framework*	Rod Johnson et al.,	Wrox	2017.

Web References/ Video Links (NPTEL, SWAYAM…)	
Sl.No	**Link ID**
1	NPTEL – Java Enterprise Technologies (JDBC, Servlets, JSP) https://nptel.ac.in/courses/106/105/106105210/
2	SWAYAM – Advanced Java Programming https://swayam.gov.in/nd2_cec20_cs05/preview
3	NPTEL – Java Programming https://nptel.ac.in/courses/106/105/106105191/
4	NPTEL – Enterprise Java and Spring Framework https://nptel.ac.in/courses/106/105/106105231/
5	YouTube – Telusko: Advanced Java and Spring Framework Tutorials https://www.youtube.com/c/Telusko

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the lifecycle of a thread in Java with a neat diagram.
2. Differentiate between Thread class and Runnable interface with examples.
3. Describe thread synchronization and inter-thread communication in Java.
4. Explain socket programming and develop a simple client-server communication model.
5. Discuss Servlet architecture and lifecycle. Explain the roles of doGet() and doPost() methods.

Course Outcome 2 (CO2):

1. Explain JSP architecture and lifecycle with suitable examples.
2. Discuss JSP implicit objects and their applications in web development.
3. Explain JSP scripting elements: declarations, expressions, and scriptlets with examples.
4. Describe Expression Language (EL) and JSTL in JSP applications.
5. Explain the MVC architecture using JSP as the view component.

Course Outcome 3 (CO3):

1. Explain JDBC architecture and the different types of JDBC drivers.
2. Describe the steps involved in establishing a database connection using MySQL and JDBC.
3. Differentiate between Statement, PreparedStatement, and CallableStatement.
4. Explain transaction management and batch processing in JDBC applications.
5. Discuss the role of ResultSet and ResultSetMetaData in database applications.

Course Outcome 4 (CO4):

1. Explain the concepts of Inversion of Control (IoC) and Dependency Injection (DI) in Spring Framework.
2. Discuss Spring bean configuration using XML and annotations.
3. Explain Spring MVC architecture with the role of controllers.
4. Describe Spring JDBC and its advantages in database operations.
5. Explain RESTful web services using Spring Boot with a suitable example.

Model Question Paper

Reg No.:_____ Name:_____

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY

MCA S2 (R,S) Examination …….. 2026 (2026 Scheme)

Course Code: 26CAPC8001

Course Name: Advanced Java Programming

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

		CO	Marks
1	Explain the lifecycle of a thread in Java with suitable methods.	CO1	(3)
2	What is socket programming? Mention the role of ServerSocket and Socket classes.	CO1	(3)
3	List the implicit objects available in JSP and mention their uses.	CO2	(3)
4	Explain the use of directives and action tags in JSP with suitable examples.	CO2	(3)
5	Differentiate between Statement, PreparedStatement, and CallableStatement in JDBC.	CO3	(3)
6	What are the different types of JDBC drivers? Explain briefly.	CO3	(3)
7	Define Dependency Injection. How does it improve modularity in Spring applications?	CO4	(3)
8	What are RESTful web services? How are they implemented using Spring Boot?	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module I

9	a) Explain thread synchronization and inter-thread communication with examples.	CO1	(5)
	b) Write a Java program to demonstrate client-server communication using socket programming..	CO1	(4)
	OR		
10	a) Explain the architecture and lifecycle of Servlets.	CO1	(5)
	b) Discuss session management techniques in Servlets	CO1	(4)
	Module II		
11	1. Explain the architecture and lifecycle of JSP.	CO2	(5)
	b) Illustrate the MVC pattern implementation using JSP as a view component.	CO2	(4)
	OR		
12	a) What is Expression Language (EL)? Explain with examples.	CO2	(5)
	b) Discuss the use of JSTL tags in modular web design.	CO2	(4)
	Module III		
13	a) ExExplain the JDBC architecture and describe connection establishment steps.	CO3	(5)
	b) Write a Java program to insert and retrieve employee details using JDBC.	CO3	(4)
	OR		
14	a) Discuss transaction management and batch processing in JDBC.	CO3	(5)
	b) Illustrate exception handling in JDBC with an example.	CO3	(4)
	Module IV		
15	a) Explain the architecture and workflow of Spring MVC with a neat diagram.	CO4	(5)
	b) Describe IoC and Dependency Injection in Spring.	CO4	(4)
	OR		
16	a) Explain how RESTful web services are developed using Spring Boot.	CO4	(5)
	b) Discuss the importance of Spring JDBC in enterprise applications.	CO4	(4)

*****