

## Teaching Guidelines for Web-based Java Programming PG-DAC March 2022

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**Duration:** 100 hours (46 class room hours + 44 lab hours + 10 revision/practice hours)

**Objective:** To learn advanced concepts in java programming and perform web Programming using Java.

**Prerequisites:** Knowledge of core Java programming

**Evaluation:** 100 marks

**Weightage:** Theory exam – 40%, Lab exam – 40%, Internals – 20%

**Text Book:**

- Core and Advanced Java Black Book / Dreamtech Press

**References:**

- Servlet and JSP: A Tutorial by Budi Kurniawan / Brainy Software
  - Spring in Action by Craig Walls / Manning Publications
  - Advanced Java programming by Uttam K Roy / Oxford University press
  - Sun Certified Enterprise Architect for Java EE Study Guide by Mark Cade & Humphrey Sheil / Pearson Education
  - Professional Java EE Design Patterns by Murat Yener, Alex Theedom & Reza Rahman / Wrox
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(Note: Each Session is of 2 hours)

**Session 1:**

**Lecture:**

J2EE Overview

- J2EE Container
- Packaging Web applications
- J2EE compliant web application
- Deployment tools.
- Web application life cycle
- Deploying web applications.
- Web Services Support

**No Lab**

**Sessions 2, 3 & 4:**

**Lecture:**

- Servlets: Dynamic Content Generation
- Advantages of Servlets over CGI
- Servlet Life cycle
- Servlet API & Deployment
- Servlet Annotations
- The Servlet interface

- The HttpServlet, HttpServletRequest, HttpServletResponse
- Exception Handling
- Servlet, DAO, POJO DB Layers
- Session
- Session Management
- Session Tracking with
  - Cookies
  - HttpSession
- Request Dispatcher
- Page Navigation
- Complete Case study Servlet Based

**Lab:**

- Installing a servlet container (Tomcat)
- Adding Server to IDE
- Develop a structured dynamic web application(e.g. Library Management System) using servlets, deploy it in Tomcat
- Use HTTP Session in the Air Ticket Reservation System

*Reading:* Know more about the HTTP protocol at [www.w3c.org](http://www.w3c.org)

*Tutorial:* Compare which way of session tracking is better Cookies or HttpSession.

**Sessions 5 & 6:**

**Lecture**

- JSP: Separating UI from Content generation code
- MVC architecture
- Design Pattern: MVC Pattern
- Life cycle of a JSP page
- Directives, Implicit and Explicit Objects, Scriptlets, Expressions, Expression Language
- Scope
- JSP Error Page handling
- JSTL

**Lab:**

- Separate UI code from the controller code in your Library Management System by incorporating JSP and Servlets.
- Complete the implementation of Air Ticket Reservation System.
- Implement MVC based web application using Servlet, JSP

**Sessions 7 & 8:**

**Lecture:**

**JDBC & Transaction Management**

- Introduction to JDBC API
- JDBC Architecture
- JDBC Drivers
- JDBC Classes& Interfaces: Driver, Connection, Statement, PreparedStatement, ResultSet and their relationship to provider implementations
- Stored procedures and functions Invocation
- SQL Injection overview and prevention

- Design Pattern: Data Access Object Pattern

**Lab:**

- Add Database CRUD operations to above MVC web application using JDBC Classes and interfaces. Use DAO and POJO Layers

**Sessions 9, 10 & 11:**

**Lecture:**

- Hibernate Framework
  - Introduction to Hibernate Framework
  - Architecture
- Hibernate in IDE
  - Creating web application using Hibernate API
  - Lifecycle of Hibernate Entities
- HB with annotation example
- Hibernate Mappings and Relationships
- Collection and Component Mapping
- HQL, Named Queries, Criteria Queries

**Lab:**

- Demonstrate Hibernate as standalone library in Java application
- Develop a web application (Online Bookshop) using Hibernate Persistence

*Reading:* Study Hibernate architecture from [www.hibernate.org/docs](http://www.hibernate.org/docs)

**Sessions 12, 13 & 14:**

**Lecture:**

- What is Spring Framework
- Overview of Spring Architecture
- Spring MVC architecture
- Spring Modules Overview
- Understanding Spring 4 annotations (Basic Introduction)
- What is IoC (Inversion of Control)
- IOC container
- Dependency Injection
- Spring Beans
- Autowiring Beans
- Bean Scopes
- Spring MVC
- Model, Model & View, HandlerMapping, ViewResolver
- Design Pattern: Front Controller Pattern
- Spring MVC Web application with JSP views (without Spring Boot)
- Using Thymleaf as alternate View Technology (only introduction)
- Spring Validations
- Spring i18n, Localization, Properties
- File Upload example

**Lab:**

- Design and deploy Library Management System using Spring Web

## **Sessions 15 & 16:**

### **Lecture:**

- Spring Boot essentials
- Why Spring boot
- Spring Boot Overview
- Basic Introduction of MAVEN
- Building Spring Web application with Boot
- Spring Boot in detail (Use Spring Boot for all demo & assignments here onwards)
- Running a web application using Spring Boot with CRUD (with Static Data not DB)
- Spring Data JDBC

### **Lab:**

- Create Hello World Spring Boot Web application
- Check Libraries imported by Spring Boot
- Create Spring Boot CRUD application with Thymeleaf as View technology and Spring JDBC

## **Sessions 17 & 18:**

### **Lecture:**

#### Spring Data Module

- Spring Data JPA (Repository support for JPA)
- Crud Repository & JPA Repository
- Query methods
- Using custom query (@Query)

### **Lab:**

- Add CRUD operations with Spring JPA etc. to earlier Spring Web application.

## **Session 19:**

### **Lecture:**

#### Spring AOP

- AOP Overview
- Spring AOP
- AOP Terminology and annotations: Advice, Join Points, Pointcuts, Aspects

### **Lab**

- Modify earlier Spring MVC application to Log all the requests using AOP

## **Sessions 20 & 21:**

### **Lecture:**

#### Building REST services with Spring

- Introduction to web services
- SOAP Vs RESTful web services
- RESTful web service introduction
- Create RESTful web service in java using Spring Boot
- RESTful web service JSON example
- RESTful web service CRUD example
- Using POSTMAN client to invoke REST API's
- REST service invocation using REST Template

### **Lab:**

- Create REST API for Employee Management using Spring Boot

- Invoke it from POSTMAN app
- Invoke it from another Spring Boot Web application using REST Template

## **Session 22 & 23:**

### **Lecture:**

#### **Testing in Spring**

- Testing in Spring
- Unit Testing of Spring MVC Controllers
- Unit Testing of Spring Service Layer
- Integration Testing of Spring MVC Applications: REST API
- Unit Testing Spring MVC Controllers with REST

#### **Securing Web Application with Spring Security**

- What is Spring Security
- Spring Security with Spring Boot
- Basic Authentication
- Authentication with User credentials from Database and Authorization

### **Lab:**

- Design & Test Spring Application
- Secure the Spring Web application created in earlier exercise.