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109. JavaServer Pages

Version 2.0.2

This four-day course develops skills in JavaServer Pages, or JSP, which is the standard means of authoring dynamic content for Web applications under the Java Enterprise platform. It treats JSP 2.0, including older features such as scriptlets but focusing on newer features and techniques, including JSP expressions and the JSTL. At the end of the course, students will be well prepared to author JSPs for small- or large-scale Web applications, either "by hand" (they use only a text editor in class) or using an authoring tool.

The first module begins with an introduction of Web applications in general, shows how Java servlets and JSPs establish a framework for writing Web applications, and then covers JSP 2.0 features in detail, from scripting elements to use of dedicated JavaBeans to JSP expressions, and quick introductions of JSTL and custom tag development.

By the end of the module students will be able to create their own JSP applications, including interactive applications using HTML forms and pages that perform fairly complex processing using scripts and or actions. Although scripting is covered, the scriptless authoring style encouraged by the JSP 2.0 specification is emphasized, and students will be well equipped to develop concise and effective JSP applications.

The second module covers the JSTL, or JSP Standard Tag Library, actually a set of four custom tag libraries that establish a portable standard for common processing tasks in JSP. JSTL is a major part of the new scriptless authoring style encouraged (and enabled) by the JSP 2.0 specification. This module covers all four JSTL libraries in depth:

- The core actions, which support JSP expressions for JSP 1.x containers, flow control for procedural processing in JSPs, and resource access.
- The formatting and internationalization/localization actions, which standardize formatted numeric and date/time output as well as multi-language support.
- The SQL actions, which dramatically simplify access to relational data from a JSP.
- The XML actions, which give JSPs a simple, powerful framework by which to parse, address and transform XML data using XPath and XSLT.



Each individual tag in each library is covered, with precise syntactic rules shown in a standard format in the student guide, and JSTL techniques and best practices are discussed for each library. An extensive set of example applications illustrates common usage of each major group of actions, and the module culminates with a wrap-up workshop that brings core, SQL, and XML techniques to bear in a single application.

Prerequisites

- Knowledge of HTML and background in Web applications will be helpful but is not strictly necessary. Deep Java experience is not required, but some familiarity with the language is recommended for some of the exercises.





Learning Objectives

- Explain the fundamentals of HTML and HTTP in the World Wide Web.
- Describe JavaServer Pages and their relationship to servlets and J2EE generally.
- Describe how a JSP is translated into a servlet and processed at runtime.
- Explain the use of directives on JSPs and outline the principal directives.
- Implement simple JSPs that use Java code in declarations, expressions and scriptlets.
- Enumerate and use the implicit objects available to scripting elements.
- Implement an interactive Web application using HTML forms and JSP.
- Use Java exception handling and JSP error pages to handle errors in JSP applications.
- Implement session management for a JSP application.
- Manage cookies to store client-specific information at various scopes and durations.
- Use JavaBeans to implement effective interactive JSP applications.
- Describe custom tags in JSP and explain how they are implemented, both using Java and JSP itself, and how they are used.
- Discuss threading issues in JSP and describe the use of directives to control how threading is handled.
- Describe the various uses of XML in JSP applications.
- Deploy a logical Web application to a Web server in a WAR file.
- Describe the use of the JSP expression language to simplify dynamic page output.
- Write JSP expressions and implement JSPs that use them in favor of scripts.
- Implement JSPs that use basic JSTL actions to simplify presentation logic.
- Decompose a JSP application design into fine-grained, reusable elements including JavaBeans, custom tag handlers and tag files that use JSTL.
- Use core JSTL actions to complement standard actions, custom actions, and JSP expressions for seamless, script-free page logic.





- Direct conditional and iterative processing of page content by looping through ranges of numbers, over elements in a collection, or over tokens in a master string.
- Set locale and time zone information in JSPs, and use them to correctly format numbers, dates and times for all clients.
- Use resource bundles to manage application strings, and produce the appropriate strings at runtime for a particular client locale.
- Locate a data source, query for relational data, and parse result sets.
- Perform updates, inserts and deletes on relational data using SQL actions.
- Manage queries and updates in transaction contexts.
- Derive information from parsed XML content using XPath expressions.
- Implement conditional processing and loops based on XML information.
- Apply XSLT transformations to XML content.
- Implement a simple Web service that reads and writes SOAP.

Timeline: 4 days.

IDE Support: Eclipse WTP 1.5

In addition to the primary lab files, an optional overlay is available that adds support for Eclipse WTP 1.5. Students can code, build, deploy, and test most exercises from within the IDE. Some JSTL exercises that use shared custom tags or require special server configurations must be deployed from a DOS console. See also our orientation to Using Capstone's Eclipse Overlays, and please be advised that this is an optional feature; it is not a separate version of the course, and the course itself does not contain explicit Eclipse-specific lab instructions.





Module 1. Introduction to JSP

Chapter 1. Web Applications

- The World Wide Web
- HTML
- Web Servers
- HTTP
- Dynamic Web Pages
- CGI
- Java Web Technologies
- Servlets
- JSP

Chapter 2. JSP Architecture

- JSP Containers
- Servlet Architecture
- Page Translation
- Types of JSP Content
- Directives
- Content Type
- Buffering
- Scripting Elements
- JSP Expressions
- Standard Actions
- Custom Actions and JSTL
- Objects and Scopes
- Implicit Objects
- JSP Lifecycle

Chapter 3. Scripting Elements

- Translation of Template Content
- Scriptlets
- Expressions
- Declarations
- Dos and Don'ts
- Implicit Objects for Scriptlets
- The request Object
- The response Object





The out Object

Chapter 4. Interactive JSP Applications

- HTML Forms
- Reading CGI Parameters
- JSPs and Java Classes
- Error Handling
- Session Management
- The Session API
- Cookies and JSP

Chapter 5. Using JavaBeans

- Separating Presentation and Business Logic
- JSP Actions
- JavaBeans
- Working with Properties
- `<jsp:useBean>`
- `<jsp:getProperty>` and `<jsp:setProperty>`
- Using Form Parameters with Beans
- Objects and Scopes
- Working with Vectors

Chapter 6. The Expression Language and the JSTL

- Going Scriptless
- The JSP Expression Language
- EL Syntax
- Type Coercion
- Error Handling
- Implicit Objects for EL
- The JSP Standard Tag Library
- Role of JSTL
- The Core Actions
- Using Beans with JSTL
- The Formatting Actions
- Scripts vs. EL/JSTL

Chapter 7. Advanced JSP Features

- Web Components
- Forwarding





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Outline

- Inclusion
- Passing Parameters
- Custom Tag Libraries
- Tag Library Architecture
- Implementing in Java or JSP
- Threads
- Strategies for Thread Safety
- XML and JSP
- JSP for Web Services





Module 2. The JSP Standard Tag Library

Chapter 1. Effective JSTL

- The JSP Standard Tag Library
- JSTL Namespaces
- Going Scriptless
- Object Instantiation
- Sharing Objects
- Decomposition
- Parameterization

Chapter 2. The Core Actions

- The JSTL Core Library
- <c:out>
- <c:set>
- Gotchas
- Conditional Processing
- Iterative Processing
- Iterating Over Maps
- Tokenizing Strings
- Catching Exceptions
- Resource Access

Chapter 3. The Formatting and i18n Actions

- The JSTL Formatting Library
- Locales
- Determining Locale
- Time Zones
- Setting Locale and Time Zone
- Formatting and Parsing Dates
- Formatting and Parsing Numbers
- Internationalization
- Working with Resource Bundles
- Supporting Multiple Languages

Chapter 4. The SQL Actions

- The JSTL SQL Library





- Using Relational Data
- Connecting with a DriverManager
- Connecting via a DataSource
- The Result Interface
- Making a Query
- Inserts, Updates and Deletes
- Parameterized SQL
- Transactions

Chapter 5. The XML Actions

- The JSTL XML Library
- Using XML
- XML Data Sources
- Parsing and Addressing
- Using XPath in JSTL
- XPath vs. EL
- XPath Context
- Implicit Objects for XPath
- Conditional Processing
- Iterative Processing
- Changing XPath Context
- Working with XML Namespaces
- Using XSLT
- Chaining Transformations
- Reading XML from the Request Body
- XML and SOAP Web Services

Appendix A. Learning Resources

System Requirements

Hardware Requirements (Minimum)	500 MHz, 256 meg RAM, 500 meg disk space.
Hardware Requirements (Recommended)	1.5 GHz, 512 meg RAM, 1 gig disk space.
Operating System	Tested on Windows 2000 Professional. Course software should be viable on all systems which support a J2SE 1.4 SDK.
Network and Security	Limited privileges required -- please see our standard security requirements at http://capcourse.com/Guides/Security.html .
Software Requirements	All free downloadable tools.

