



Java for Web Development
A Part of the *Java: Under the Hood* Series

Java for Web Development
A Part of the *Java: Under the Hood* Series
Version 2.1

March, 2003

Copyright © 1999-2003 JLicense, Inc. 840 Alta Vista Drive, Rapid City, SD 57701,
U.S.A. All rights reserved.

This product or document is protected by copyright and distributed under licenses restricting its use, copying, distribution, and decompilation. No part of this product or document may be reproduced in any form by any means without prior written authorization of JLicense, Inc.

Under the Hood is a trademark of JLicense, Inc. in the U.S. and other countries. Sun, JDK, and Java are trademarks or registered trademarks of Sun Microsystems, Inc. in the U.S. and other countries. All other names are used for identification purposes only and are trademarks of their respective companies.

DOCUMENTATION IS PROVIDED "AS IS" AND ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID.

This manual prepared by:

JLicense, Inc.
840 Alta Vista Drive
Rapid City, SD 57701
USA

Web: <http://www.javalicense.com>

Course Description

This course covers the Java technologies used to develop Java Web applications. The key topics discussed are Java Servlets, JavaServer Pages (JSP) and XML. Students will learn: the details of developing and deploying servlets and JSP pages, how to design Java Web applications using the Model-View-Controller (MVC) design, how JavaBeans fit into the MVC design, using JDBC and JavaBeans to create Data Access Objects, and how to develop Java Web components that take advantage of XML using the Java API for Processing (JAXP). Students will learn how to deploy and administer Java Web applications on Apache Tomcat using the MySQL database.

Course Length:

5 days

Audience:

Beginning Java programmers new to JDBC and JavaBeans who need to learn how to develop Web applications using the various Java technologies like Servlets, JavaServer Pages, and XML. Students should be familiar with the Java language and Web technologies like HTML. Familiarity with SQL is also helpful.

Objectives:

- Understand the various components in a Java Web application.
 - Learn how Servlets and JavaServer Pages fit into the J2EE environment.
 - Understand the Model-View-Controller design of a Java Web application.
 - Learn how to install and setup the Tomcat Web server and mySQL database server.
 - Understand the lifecycle of a Java servlet and JavaServer Page.
 - Learn how to write and a deploy a Java servlet and JavaServer Page.
 - Understand the directory structure of Java Web applications.
 - Understand the various scopes an object can have in a servlet container.
 - Learn how to include and forward a request to another Web component.
 - Learn how to create client session in JSP and servlets.
 - Understand how JavaBeans are used to create Data Access Objects.
 - Learn how to access data in a database using JDBC.
 - Learn how to write effective and useful servlets and JSP pages.
 - Understand the various elements of a JavaServer Page.
 - Learn how to create a custom JSP tag library.
 - Learn how to use the JSP Standard Tag Library.
 - Understand XML, including its uses, syntax and advantages.
 - Learn how to develop Java applications that create and use XML documents.
-

Weekly Schedule

The following is a tentative schedule for the pacing of the course. The actual flow of the course may vary.

Day One

- Chapter 1: An Overview of Java Web Development
- Chapter 2: An Introduction to Servlets
- Chapter 3: Writing Servlets

Day Two

- Chapter 4: The Model: JavaBeans and JDBC
- Chapter 5: Using Servlets Effectively

Day Three

- Chapter 6: An Introduction to JavaServer Pages
- Chapter 7: Using JavaBeans within JSP

Day Four

- Chapter 8: An Introduction to XML
- Chapter 9: Custom JSP Tags

Day Five

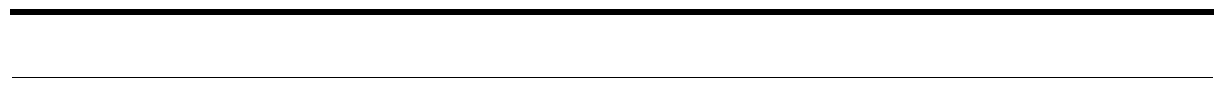
- Chapter 10: JSP Standard Template Library (JSTL)
- Chapter 11: Java API for XML Processing

Table of Contents

Course Description	iii
Objectives:	iv
Weekly Schedule	v
Chapter 1 Overview of Java Web Development.....	1
Web Application Development	2
Java Web Application Development Lifecycle	4
Java Web Servers	6
The J2EE Technologies	8
An Overview of JavaServer Pages	10
The Model-View-Controller Design	12
Setting up Your PC	14
Lab 1: Setting up the BEST database	26
Chapter 2 An Introduction to Servlets	31
An Overview of Servlets	32
Advantages of Servlets	34
Lifecycle of a Servlet.....	36
The Java Servlet API.....	38
The service() Method	40
The HttpServlet Class	41
The "Hello, World" Servlet	42
Compiling the Servlet	44
The Directory Structure of a Web Application	46
The Web Application Deployment Descriptor	48
Deploying a Servlet on Tomcat	50

Step 1: Start the Tomcat Manager.....	51
Step 2: Enter the path to web.xml	52
Step 3: Access the servlet.....	54
Lab 1: The RequestInfo Servlet.....	56
Chapter 3 Writing Servlets	61
HTTP.....	62
Requests	64
Responses	66
HttpServletRequest	68
HttpServletResponse	70
Request Parameters	72
The Request Dispatcher	76
An Example of Including	78
Lab 1: The Servlet Controller.....	82
Object Scope.....	86
Request Scope	88
An Example of Request Scope	90
Using Internationalization	92
Application Scope	96
Session Scope	98
Cookies	100
The Cookie Class	102
An Example Using Cookies	104
The session Object.....	106
An Example of a Session.....	108
URL Rewriting	110
An Example of URL Rewriting.....	112
Lab 2: Using Resource Bundles	114
Lab 3 - The Shopping Cart	118
Chapter 4 The Model: JavaBeans and JDBC	121

The MVC Design	122
Advantages of MVC Design	124
Data Access Objects	126
Overview of JavaBeans	128
JavaBeans and JavaServer Pages.....	129
JavaBeans	130
Simple Properties	131
An Example of Simple Properties	132
A JavaBean DAO	134
Lab 1: Writing a JavaBean	138
Overview of JDBC.....	140
JDBC Drivers	142
Connecting to a Database.....	144
An Example of Connecting to a Database.....	145
Using Connection Pools	146
Defining a Data Source in Tomcat.....	147
Modify the web.xml File.....	150
The server.xml File	152
Looking Up the DataSource	154
JDBC Simple Statements	156
An Example of Simple Statements	158
Prepared Statements	160
Executing a PreparedStatement	162
An Example of a PreparedStatement.....	164
Result Sets.....	166
Scrollable Result Sets	167
Concurrency in Result Sets	168
Navigating Result Sets	170
Updating a Result Set	172
An Example of Updating a Result Set	174
Callable Statements.....	176
Lab 2: Browsing the Inventory	178
Lab 3: Deleting Items from the Inventory	180



An SQL Reference	182
Chapter 5 Using Servlets Effectively	189
Initializing Servlets	190
Destroying a Servlet.....	191
The Servlet Thread Models	192
The Single Thread Model.....	194
Cleanly Destroying a Servlet	196
Servlet Listeners.....	200
The Delegation Model	201
An Example of a Session Counter.....	202
Registering a Listener.....	204
Using Filters.....	206
The Filter Interface	207
An Example of a Filter Class	208
Deploying a Filter.....	210
Lab 1: Writing a Servlet Listener.....	212
Chapter 6 An Introduction to JavaServer Pages	215
Overview of JavaServer Pages	216
JSP or Servlets?.....	217
JavaServer Pages and Servlets	218
The Lifecycle of a JSP Page.....	220
A Simple JavaServer Page.....	222
Deploying a JSP Page	224
JavaServer Page Tags	226
Declarations.....	228
The Generated Servlet Class.....	230
Expressions	232
Implicit Objects	234
The request Object	236
The Methods of the Request Object	237

Parameters.....	238
Scriptlets	242
A JSP Using a Data Access Object.....	244
The include Tag.....	248
An Example Using include.....	250
Directives.....	252
The Page Directive.....	253
JSP Actions.....	254
Lab 1: Working with JSPs	258
Chapter 7 Using JavaBeans within JSP	263
The MVC Model Revisited.....	264
JavaBeans in JSPs	265
Scope Parameter of <jsp:useBean>	266
Setting Bean Properties.....	268
Getting Bean Properties	269
JavaBeans and Form Properties	270
Validating Form Data	274
Lab 1: The ResourceBean	278
Scope.....	280
Request Scope	282
Application Scope	284
Session Scope	286
The Implicit Session Object.....	288
Beans with Session Scope	290
Lab 2: Create the ShoppingCart View.....	292
Error Pages	294
Lab 3: An Error Page for BEST	296
Chapter 8 An Introduction to XML	299
XML Tags	300
The Root Element.....	301

Attributes	302
When to Use Attributes.....	303
Entity Elements	304
Well-formed vs. Valid	306
Document Type Definition	308
Creating a DTD.....	310
The <web-app> DTD.....	312
XML Namespaces	314
Lab 1: Designing an XML Document	316
Chapter 9 Custom JSP Tags	319
Overview of Custom Tags.....	320
Steps to Create Your Own Tags	322
The javax.servlet.jsp.tagext Package	323
The Lifecycle of a Tag Handler	324
Step 1: Write the Tag Handler Class	326
The Tag Library Descriptor	328
Step 2: Create a TLD File	330
Step 3: Use the tags in a JSP	332
Step 4: Deploy the files	334
Body Tags	336
The Lifecycle of a Body Tag	337
An Example of a Body Tag.....	338
Modifying the TLD	342
The TryCatchFinally Interface	344
Lab 1: Writing a Custom JSP Tag.....	346
Chapter 10 JSP Standard Template Library (JSTL)	349
JSP Standard Tag Library (JSTL)	350
Download the JSTL.....	352
Install the JSTL.....	353
The JSP Expression Language.....	354

Accessing Data with EL	355
Accessing Collections in EL	356
The Implicit Objects of EL.....	358
The Core JSTL Tags	359
The <c:out> Tag.....	360
The <c:set> Tag	362
The <c:remove> Tag	365
The <c:if> Tag.....	366
The <c:catch> Tag	368
The <c:choose> Tag.....	370
The <c:forEach> Tag	372
The <c:url> Tag.....	376
Lab 1: Using the JSTL	380
Lab 2: Finishing the BEST Web Site	384
Chapter 11 The Java API for XML Processing	387
The Java API for XML Processing	388
Overview of SAX	390
Overview of DOM	392
Creating a SAX Parser	394
A Simple Parser	396
Parsing an XML Document Using SAX	398
Handlers	400
Content Handlers	401
Error Handlers	406
An Example of an Error	408
Validating XML Using a DTD	410
Creating a DOM Parser.....	414
Parsing an XML Document Using DOM	416
Choosing a DOM Parser	418
Understanding DOM Nodes	420
The Document Interface.....	421



Creating an XML Document Using DOM422
An Overview of XSLT424
Output a DOM Document to a File426
Lab 1: Generating an XML Document.....428

Appendix A Lab Solutions431
Lab 2-1: The RequestInfo Servlet.....432
Lab 3-1: The Servlet Controller.....433
Lab 3-2: Using Resource Bundles435
Lab 3-3: The Shopping Cart438
Lab 4-1: Writing a JavaBean.....440
Lab 4-2: Browsing the Inventory.....441
Lab 4-3: Deleting Items from the Inventory443
Lab 5-1: Writing a Servlet Listener447
Lab 6-1: Working with JSPs.....448
Lab 7-1: The ResourceBean450
Lab 7-2: Create the ShoppingCart View451
Lab 7-3: An Error Page for BEST452
Lab 9-1: Writing a Custom JSP Tag.....453
Lab 10-1: Using the JSTL.....456
Lab 10-2: Finishing the BEST Web Site458
Lab 11-1: Generating an XML Document.....459