BCSL057: WEB PROGRAMMING LAB

Structure **Page Nos.**

1.0 INTRODUCTION

This lab course provides you information about the tool that you need to use for practical of Web programming course. This lab course supports the course BCS053: Web Programming. We propose that you use an IDE such as Netbeans, Eclipse or any other IDE for web development. You are advised to install the latest version of theseIDEs. This lab course includes 10 practical sessions of 3 hours each. This lab manual lists the lab exercises that you need to perform during each of the lab sessions. You should try to use the available time by coming fully prepared with the exercise.

First two sessions are focused on HTML and CSS. You should try to create a small web site using HTML tags and CSS. Session 3 is about creating simple XML document and viewing those documents.Session 4 focusses on creating a small web page using WML that can be viewed on a mobile. Session 5 and 6 focusses on use of JavaScript. Last four sessions are devoted to writing JSP and JDBC oriented code.

You may need a web server to display the web pagesthat you may create. Fortunately, the present day IDEs also include a web server.For example Netbeansis bundled with web servers – Apache and Glassfish. For the purpose of back end database we will demonstrate the use of MySql. However, you may use any database technology at your study centre. In such case you have to use the necessary drivers.

In this lab manual, we have used NetbeansIDE 7.3.1. We first discuss about the process of installation of Netbeans along with the web server and database system. We then explain creating HTML, XML, Web Application, JSP pages etc using it.

1.1 OBJECTIVES

After completing this lab section, you should be able to:

- Install any IDE for web programming;
- Create web pages using several technologies;
- Store data in a table using web pages
- Display web pages on a web server.

1.2 DEVELOPMENT OF A SIMPLE WEBSITE

Netbeans is an IDE which provided features for developing desktop, mobile and web applications. It supports Java, HTML5 and other languages. It is an open source software which is freely available for download. it has its own web sitehttps://netbeans.org/. You can download it from the download link at this web site. You may download the bundle that includes all the tools including GlassFish Servers Open source edition and Apache's Tomcat Server. Please also note that a number of tutorials have been created by Netbeans community. These tutors are available on the web site https://netbeans.org/kb/ . You must take a video tour of key netbeans features as an IDE.

Once you have downloaded the Netbeans IDE, you can install it on the computer using the following procedure:

Run the binary installation file

In case your JDK version is older than the supported by Netbeans, it will inform you to do so. You can obtain the latest JDK from the web site: http://www.oracle.com/technetwork/java/javase/downloads/ . You may download the Java version for windows x86, in case you are using a 32 bit computer. You should install it first and then install Netbeans

Make sure that during this installation web servers are also installed.

Now, start Netbeans, it will take some time to start and the following window will open:

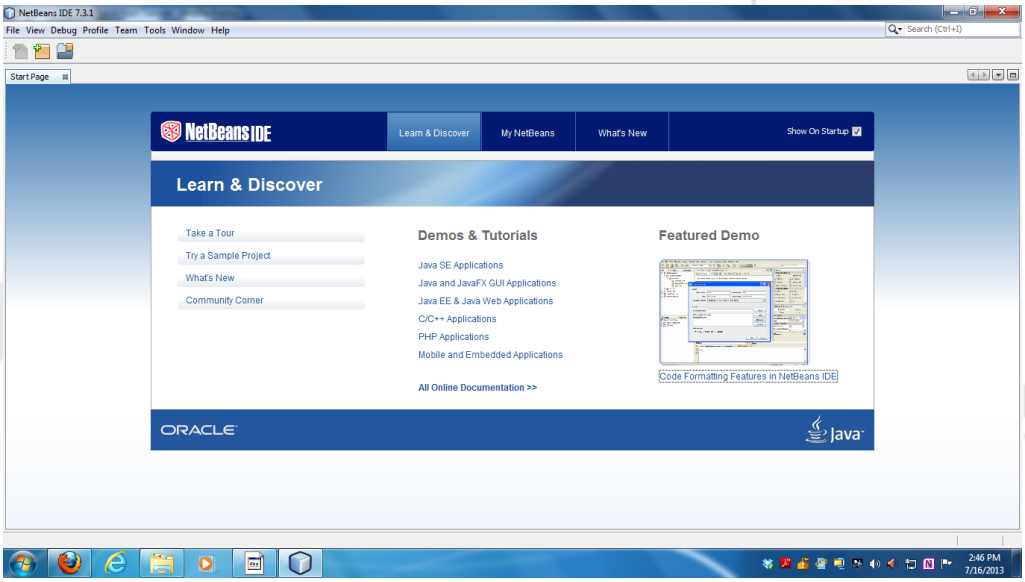


Figure 1: Start of Netbean Software

You can select the Demos and Tutorials or Featured Demo to see a demonstration of Netbeansprovided, your computer is connected to Internet.

Once you are a bit familiar with the environment, start a new project. Perform the following steps:

Select File→New (CTRL+SHIFT+N) Project from the Menu of Figure 1.

The following window will open:

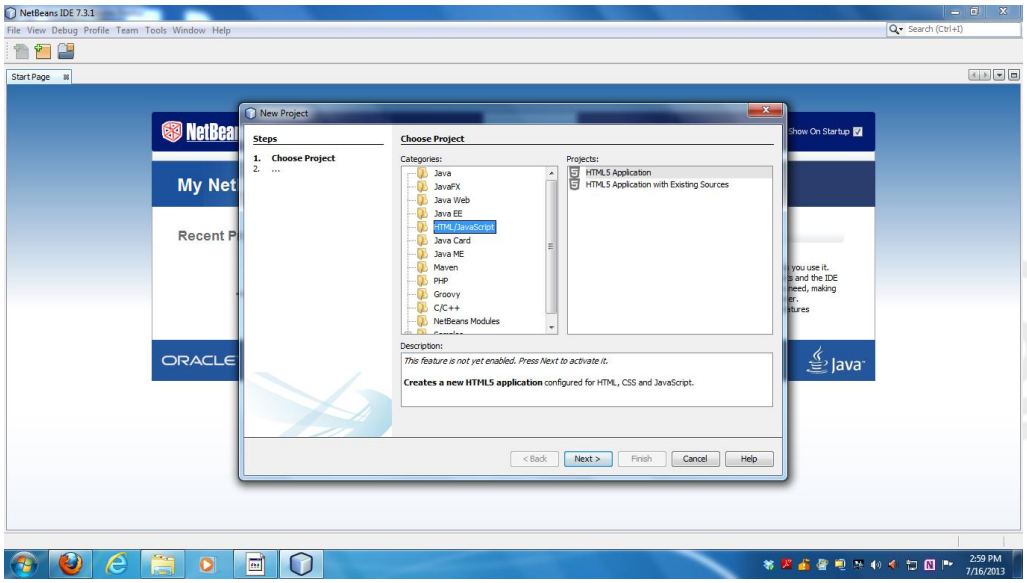


Figure 2: New Project Window

In this window you can select a category for the new project, for example, when you will design JSP project, you will select Java Web category. To begin with, you may open a new HTML 5 project. So select HTML5/JavaScript category and in the option HTML5 Application. Select the Next button.

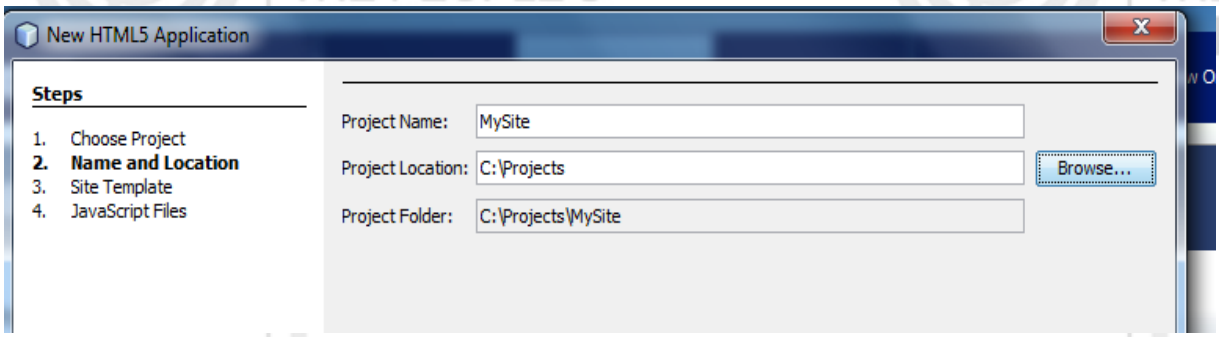
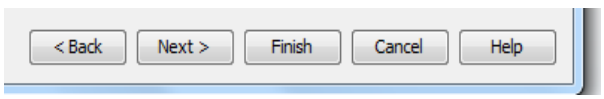


Figure 3: Selection of Name and Location of the Project

Enter project name and project location of your choice. You can observe that in the figure 3 that we have given the project name as MySite and selected a Folder C:\Projects for its location. It is a advisable to create a separate folder where you can keep all your projects. Now Select Finish from the button Panel.



You have successfully created the project. A file index.html will be created for you for editing in the Netbeans editor as show in Figure 4. Please note index.html is the default page of a website.

Now, you can create your home page of the website. For more details on various HTML tags and CSS, you may refer to Block 1 Unit 1 and Unit 2 of BCS053: Web Programming course. For the purpose of demonstration, we have used the example given in Block 1 Unit 2of BCS053. The example uses div tags for various sections of the web page. The example uses the CSS, but initially, we have removed the linkage to CSS and just created the web page. You can format this web page using the Menu Source → Format.

You need to input all the tags along with contents from the example. Figure 4 shows the contents of index.html after the html tags and contents of web page has been input. Please note that there is no CSS attached to this file even through in contains class names (please refer to BCS053 Block 1Unit 2) in the tags.

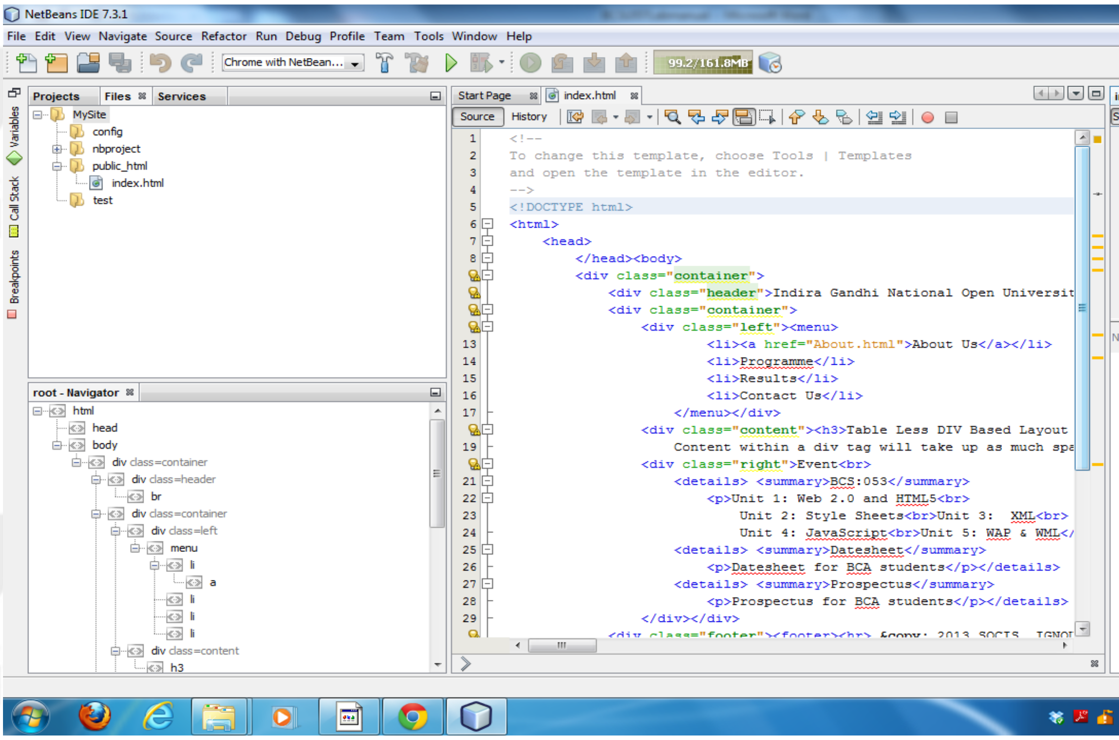


Figure 4: An example file

But, how to display the content of this webpage?

To see the web site that you have created, you can select Run→Run Project menu option or alternatively press F6 key. Please note that in case you are using Mozilla or Chrome browsers then you need to install "Netbeans connector chrome extension" which is available from the website https://chrome.google.com/webstore/. Please also note that when you will run the project nothing much will happen in Netbeans window, but the display can be seen in the browser window (chrome in this lab manual). Figure 5 shows the output of the web page of figure 4.

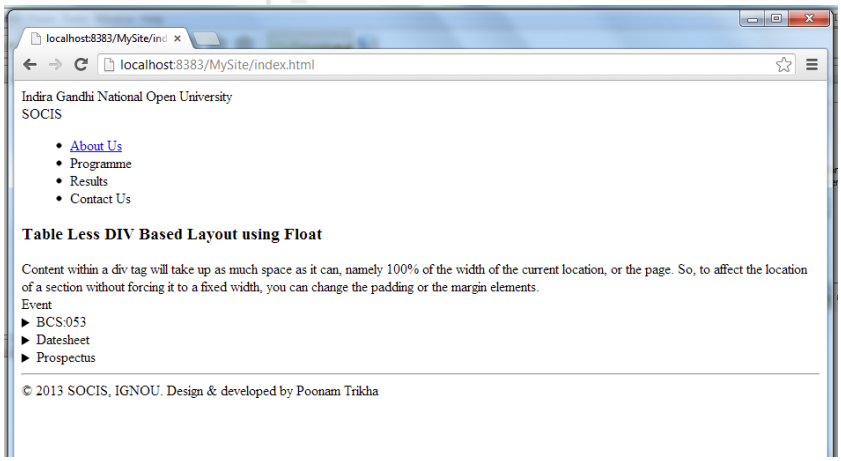
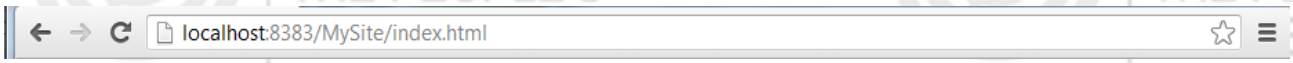


Figure 5: The display of web page of figure 4 in browser

You may please notice that the address bar of Figure 5 shows:



which means that the web page displayed is not displayed from a file but is a part of website hosted at localhost at 8383 port.

The display of web page in Figure 5 is in the sequence of appearance of different tags of html. You can change this display to a good structured display using CSS. To create a CSS file, as given in the example of BCS053Block1Unit2 named CSSLayout.css, you need to perform the following:

From the *File* Menu of Netbeans select *New File* ...a New File Window will open

In the New File window in the Category HTML/JavaScript select the file type as Cascading Style Sheet and press the Next button in the button panel. A window containing title “New Cascading Sheet” will open

In this new window, enter the name of the stylesheet- CSSLayoutin our case and press the Finish button in the button panel.

A new file will open in the Netbeans window with the name CSSLayout.css. In this file type the commands of the CSS file. Figure 6 shows the resultant state.

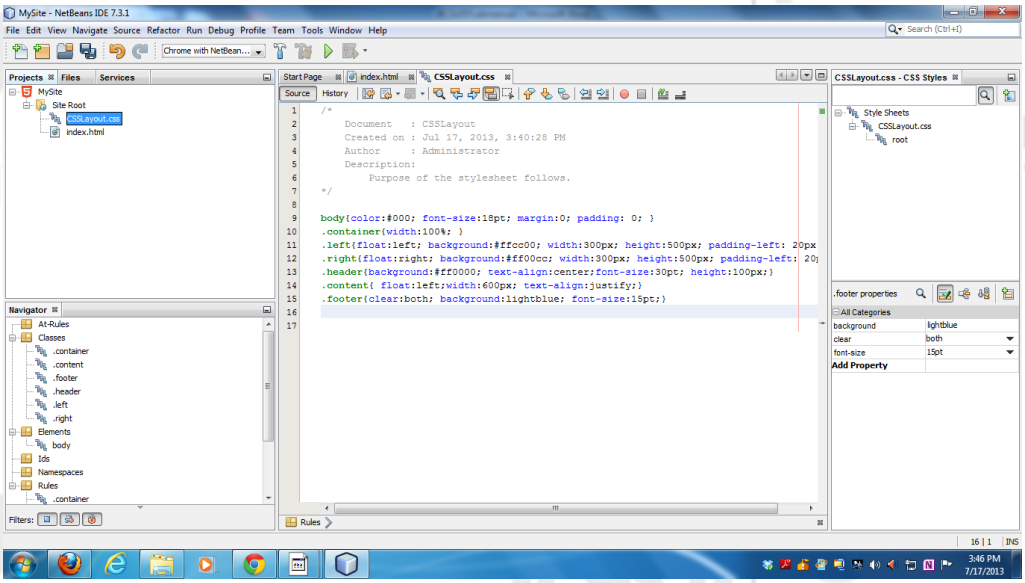


Figure 6: The CSSLayout.css file with contents.

To link this CSSLayout.css file to index.html file, you perform the following steps:

Select the tab “index.html” and add the following line in the <head></head> tags: *<link type="text/css" rel="stylesheet" href="CSSLayout.css" />*

Now, your index.html file is linked to the CSSLayout.css file. You can see how it changes the display of your webpage by pressing F6 key. Please observe how different the display is now by comparing the display of Figure 5 and Figure 7.

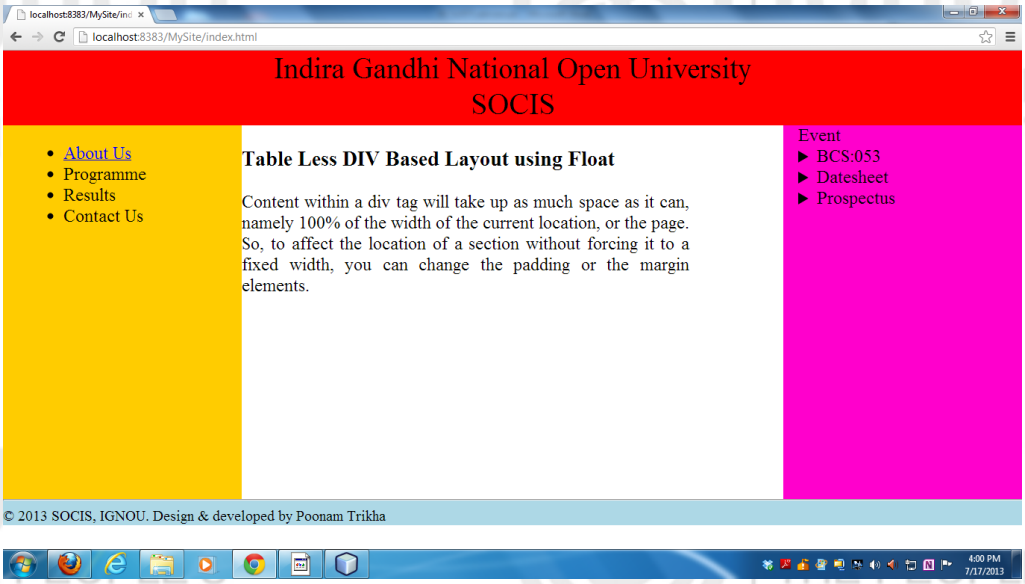


Figure 7: Display of web page of Figure 4 using CSS

Observe that in the event section only summary information is displayed. You may click on BCS053 and detailed information on it will be shown. In the left you see a simple selection options like About us, Programme etc. For every such option, you may have to develop a page. We demonstrate how you can implement *About Us*option. This time you can follow different strategy using Netbeans. In this strategy, we demonstrate the use of Palette Window. We may keep some of the sections on the website identical to the one as displayed in Figure 7, but only changing therelevant

information. The figure 8 shows the web browser display on pressing *About Us* option on Figure 7.

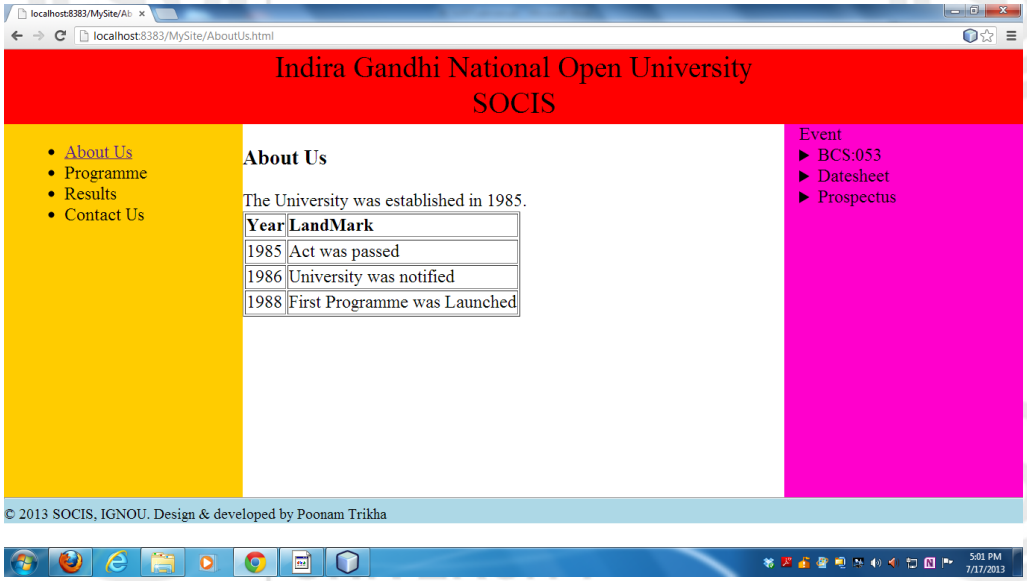


Figure 8: AboutUs page of website.

In order to develop this page you can perform the following steps:

From the *File* Menu of Netbeans select *New File* ...a New File Window will open

In the New File window in the Category HTML/JavaScript select the file type as HTML File and press the Next button in the button panel. A window containing title "New HTML File" will open

In this new window, enter the name of the file – AboutUS and press the Finish button in the button panel.

A new file with the name AboutUs.html will open in editor window. You copy the entire content of index.html file and replace all the contents of AboutUs.html by it.

Nowchange

<h3>Table Less DIV Based Layout using Float</h3>
Content within a div tag will take up as much … … …elements.

to

** <h3>About Us</h3>The University was established in 1985 **

However, you need to add a table of various landmarks, perform the following steps:

From the *Window* Menu of Netbeans select *Palette*a New Palette Window will open along with other windows

Click the mouse just after 1985 but before the tag and in the Palette window double click on Table.

An Insert Table window will open, in which select the number of rows to 3 and press Ok button.

All the opening and closing tags for table headers and table rows will be created automatically, you just insert the appropriate values between an opening and closing tags.

Figure 9 shows all the changes made using the steps given above.

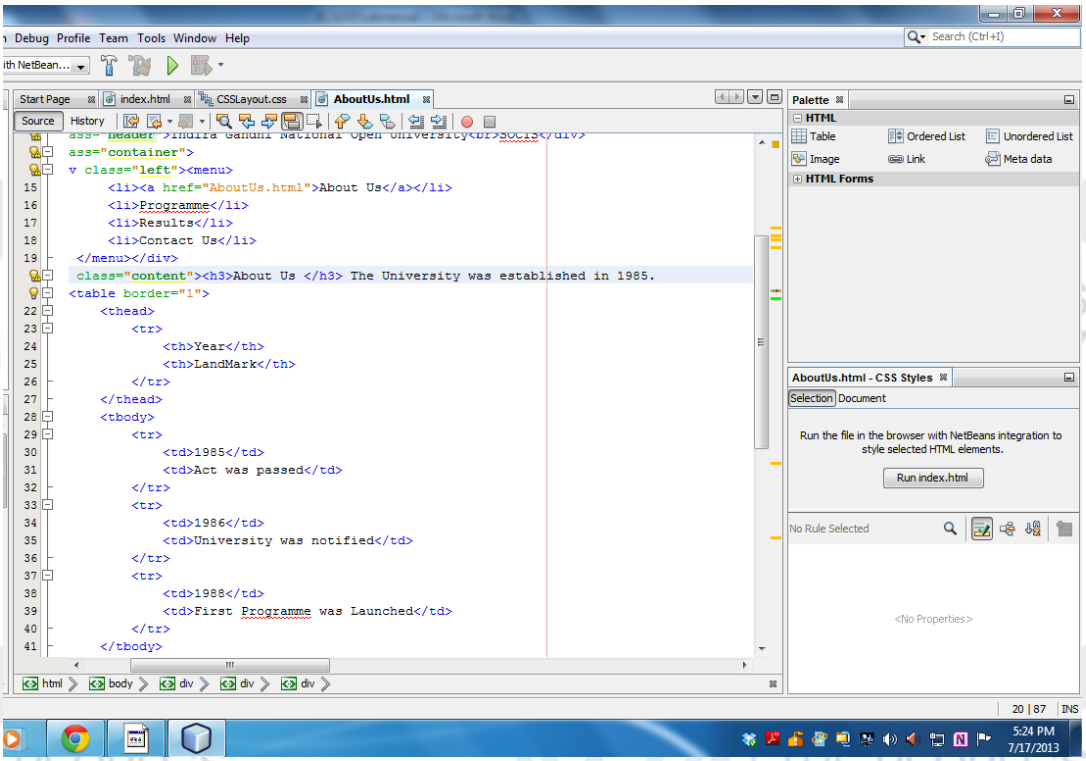


Figure 9: Use of Pallette to enter HTML tags.

But before you display this web page, just make one more change both in index.html and AboutUs.html by changing the content

About Us
html
to
**
About Us
html**

You can now press F6 key and browser will display contents as shown in Figure 8. Please note the following weaknesses in the webpages we have designed:

All the html and css files are in the same folder. In actual websites have large number of pages and cssfiles, therefore, are organized into folders setting the paths suitably through href or configuration files. You must find more about web site design from further readings.

The second weakness is that since there is redundancy of content in the two html pages, any change in common content will be difficult to maintain. This problem will be further compounded if the number of such pages is large. One of the solutions to this problem is to move common contents to a different file or files and include those files in all the files through programming language or configuration files.\

A detailed discussion on these issues are beyond the scope of this Unit, but we have introduced these aspects just to remind you that you have to keep exploring about the web programming beyond the completion of this course.

Another weakness of the website developed so far is that it is static and does not involve significant interaction with the user. In the next section, we demonstrate how to add some dynamism in the website with the help of JavaScript

1.3 USING JAVASCRIPT IN NETBEANS

Netbeans allows you to use javascript in two ways, either you can create JavaScript file and use that file in a script tag to run or you can add your own script tags in head or the body tags. We will put the JavaScript in the head tag. The event related action will be put on the body part. We demonstrate the function for change of background colour given in BCS053: Block 1 Unit4. The function changes the background colour, if you mouse over a space and changes it back to original when mouse moves out of that pace. The code to do so is reproduced below from the said Unit (with few changes)

```
<!DOCTYPE html>
<html>
<head>
<script>
functionchangebackgroundcolour(bg)
        {
document.body.style.background = bg;
        }
</script>
</head>
<body>
<p>Mouse over the squares and the background color will change!</p>
<table width="200">
<tr>
<td onmouseover="bgChange('lightblue')"
onmouseout="bgChange('transparent')"
bgcolor="lightblue"> Light Blue
</td>
<td onmouseover="bgChange('lightgreen')"
onmouseout="bgChange('transparent')"
bgcolor="lightgreen">Light Green
</td></tr>
</table>
</body>
</html>
```

Figure 10: JavaScript code for change of background colour

But, how to use this code in our existing webpages? We demonstrate it using AboutUs.html. You put the code shown in bold above in the head tag after the link tag and add the code shown in italics is added in the division having the class “content” after the table showing year and landmark. Now, you run the project using F6 and select About Us link in the browser. The browser display is shown in Figure 11. You can take your mouse over the two colour boxes with titles light blue and light green to see changes in the background colour. Figure 11 is captured when mouse pointer was over the box light green.

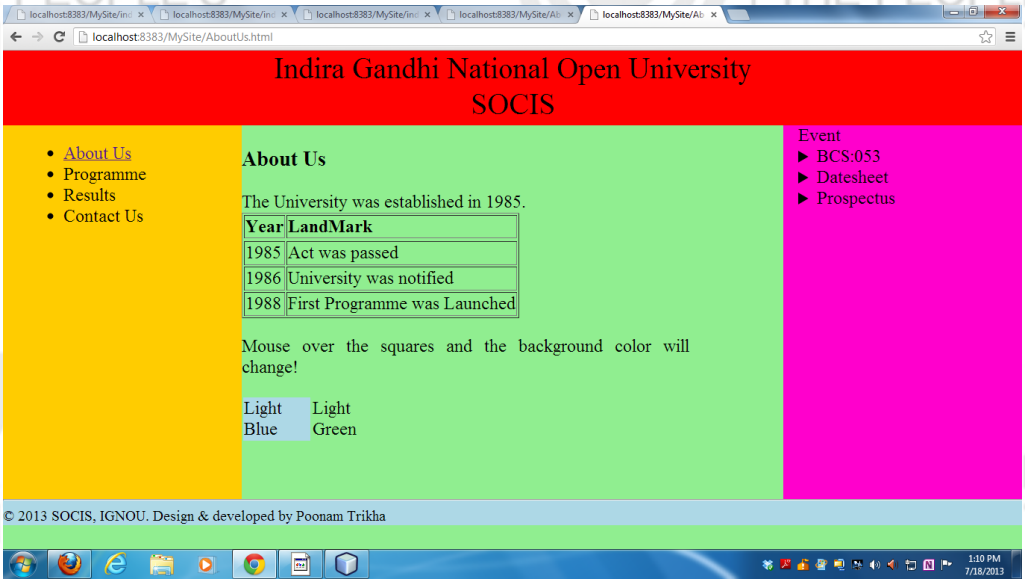


Figure 11: Browser display demonstrating use of JavaScript code of Figure 10

The event based programming along with JavaScript and dynamic features of html can be used to develop simple animations, interactive pages, form verification etc. You should search for such examples through the WWW for further learning on these. In the subsequent section we discuss about creating XML pages and also how to create a simple web page for mobile devices.

1.4 CREATING AND VALIDATING XML PAGES

So far you have created HTML5 page and JavaScript code using Netbeans. Can you create XML pages in Netbeans? Can you check these XML pages? This section shows you an example of XML page along with the related DTD. It also shows you the process of checking the XML file using DTD. You may also create XML schema and XSL stylesheet using Netbeans. However, this is left as an exercise. We first create a DTD file for customer with the following statements:

```
<?xml version="1.0" encoding="UTF-8"?>
<!ELEMENT customer (name, address)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT address (#PCDATA)>
```

Figure 12: The DTD file content

This DTD can check the following XML document created by you:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE customer SYSTEM "Customer.dtd">
  <customer>
    <name3>Arvind Gupta</name3>
    <address>IGNOU New Delhi</Address>
  </customer>
```

Figure 13: The XML file content with errors

Please note there are two mistakes in the XML as above. First the tag <name3> ouis declared as <name> and the tag <address> is closed by tag </Address> which is incorrect as the A is capital. Let us see if these errors are flagged by the Netbeans XML validation. But first you need to create the two files. You can first create a New project with the name XML project. In this project now create a new DTD file using the steps:

Select the option File→New File …
In the New File window in the categories section select XML. You will see the following window:

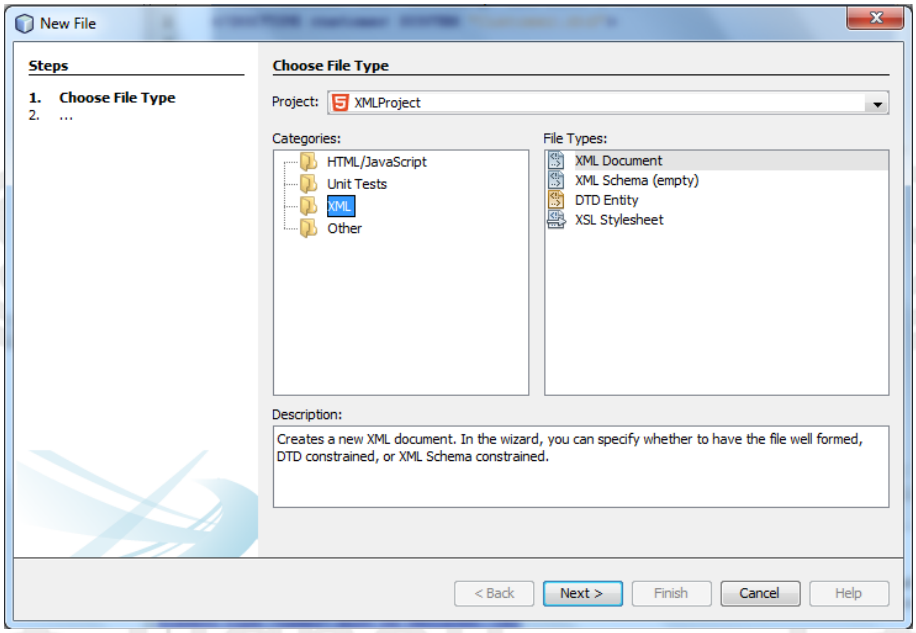


Figure 14: The XML Category files

In the File Types section select *DTD entity* and press the Next button in the button panel at the bottom of this window.
Name the File as *Customer* and press the Finish Button in the button panel
A new DTD file with the name Customer.dtd will open. Type the contents as shown in Figure 12 in the file.

Now, you have created the DTD file. Next create the XML file using the following steps:

Select the option File→New File …
In the New File window in the categories section select XML and in the File Types section select XML Document and name it *SingleCustomer*
In the file so created namely *SingleCustome.xml* type in the content as shown in Figure 13.

Now, your documents are ready for validation. Open the SingleCustomer.xml file in the editing window and select Run→ Validate XML
It will open the following window:

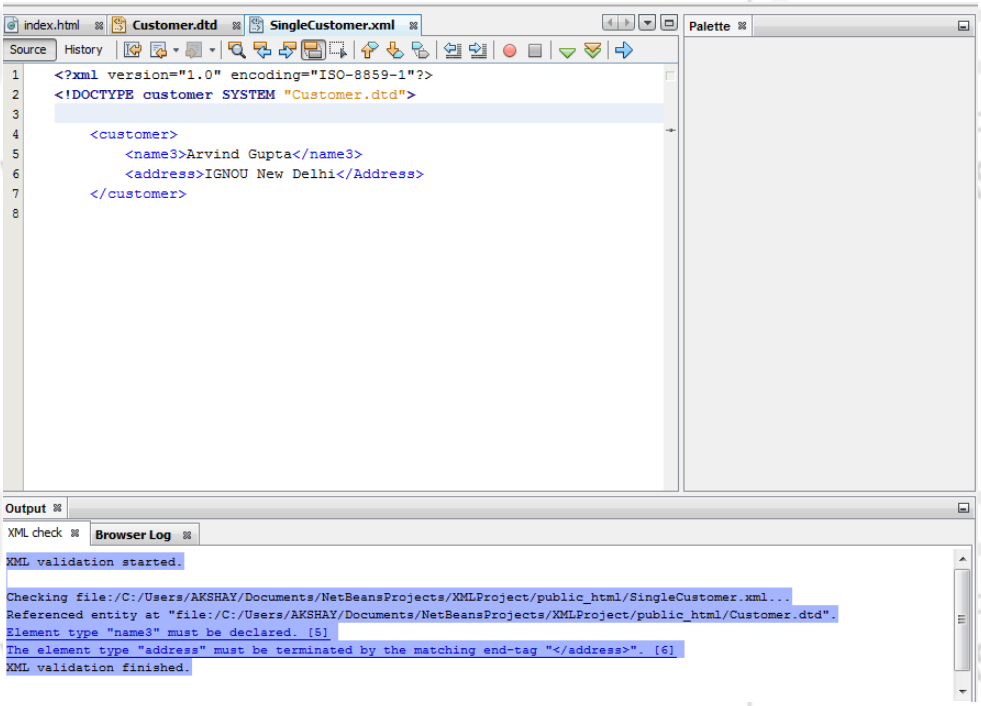


Figure 15: The highlighted output window showing errors

The window shows the following messages and errors:

> XML validation started.
> Checking file:/C:/Users/AKSHAY/Documents/NetBeansProjects/XMLProject/public_html/SingleCustomer.xml...
> Referenced entity at "file:/C:/Users/AKSHAY/Documents/NetBeansProjects/XMLProject/public_html/Customer.dtd".
>
> Element type "name3" must be declared. [5]
> The element type "address" must be terminated by the matching end-tag "</address>". [6]
>
> XML validation finished.

The messages clearly identify the errors. You just need to correct the errors by changing tag <name3> to <name>, </name3> to </name> and </Address> to </address>. After making these changes, you may run the validation again. This time no error will be reported.

1.5 RUNNING JSP PROGRAMS

Java Server Pages (JSP) programs are very useful in performing server based interactive tasks. In this section, you will be demonstrated a simple example on how you can use Netbeans to create simple website using JSP.

You have already seen an example of HTML and CSS project in section 1.2, we will modify that project to create a basic web page structure and add two important menu items – Display of current date using a file DisplayDate.jsp and Display of Visitor Number using DisplayCounter.jsp that uses a java class file VisitorCounter.java. In addition, we create two jsp files top and bottom which will be included in both the display files. The project will show the output as given in Figure 16.

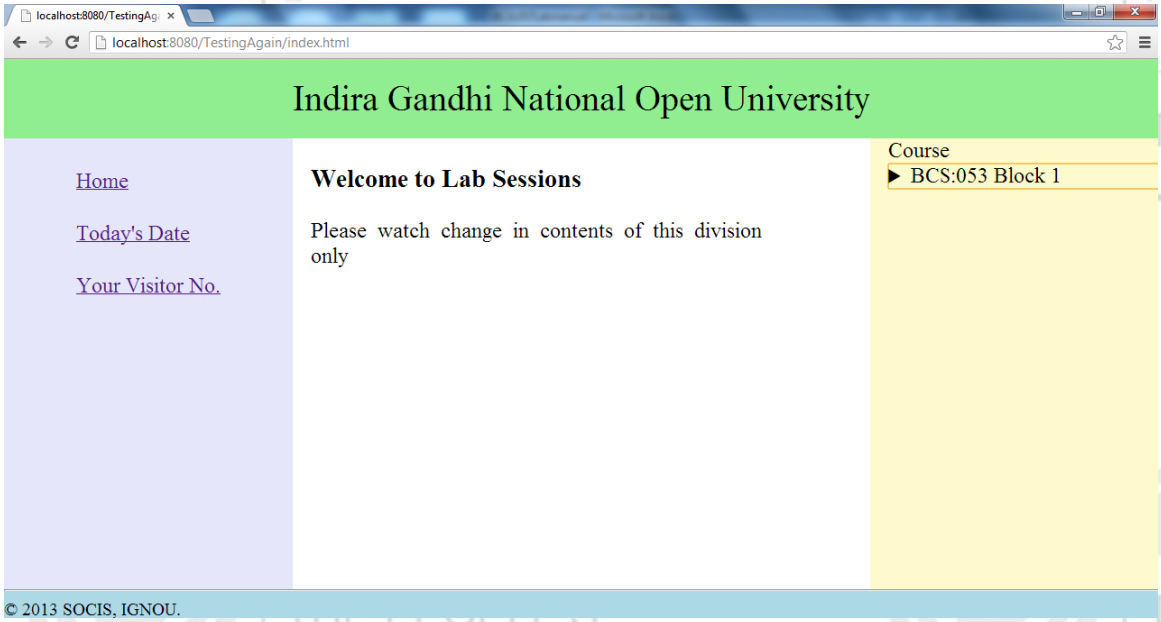


Figure 16: Display of web page in the Browser

Please note that display is from a web server (check address line which reads localhost:8080/...). On the left, you see three items namely Home, Today's Date and Your Visitor No. You can click any one, the page has been created such that it only changes the middle section, for example, if you click on the option "Your Visitor No" the display line "**Please watch change in contents of this division only**" will change to "**Your visitor number is : 1".** If you click this option again, the number will shown be 2 and so on. But, how can you create this page. To create this simple web site, we have created a simple web site consisting of the following files:

File Name : index.html

```
<!DOCTYPE html>
<html>
  <head>
    <link type="text/css" rel="stylesheet" href="CSSLayout.css" />
  </head>
  <body>
    <div class="container">
      <div class="header">
        Indira Gandhi National Open University
      </div>
      <div class="left">
        <menu>
          <li><a href="index.html">Home</a></li>
          <li><a href="DisplayDate.jsp">Today's Date</a></li>
          <li><a href="DisplayCounter.jsp">Your Visitor No.</a></li>
        </menu>
      </div>
      <div class="content">
        <h3>Welcome to Lab Sessions</h3>
          Please watch change in contents of this division only
      </div>
```

```
        <div class="right">
          Course<br>
          <details>
            <summary>BCS:053 Block 1
            </summary>
            <p>Unit 1: Web 2.0 and HTML5<br>
              Unit 2: Style Sheets<br>
              Unit 3:  XML<br>
              Unit 4: JavaScript<br>
              Unit 5: WAP & WML
            </p>
          </details>
        </div>
      </div>
      <div class="footer">
        <footer>
          <hr>&copy; 2013 SOCIS, IGNOU.
        </footer>
      </div>
    </body>
</html>
```

The index.html consists of three parts shown in three boxes. The content in the first and third boxes are common to both the DisplayDate.jsp and DisplayCounter.jsp files, as you want consistent background and sections in the web site. Is it a good idea to copy and paste the content of first and third box in both the files? Obvious answer is no as this will create unnecessary maintenance related problems. Therefore, you can copy the content of first box and third boxes into two different files. We have named these files as top.jsp and bottom.jsp files. You can include these files in the DisplayDate.jsp and DisplayCounter.jsp files. The content of these two files are shown below. But how to create a new jsp file? You can create a file using the following steps:

Create a new file using File → New File … option. A New File window will open.

In the New File Window in the Categories section select Web and select JSP in the File types section and press Next button, a New JSP window will open type in the name of the file and press Finish button in this window.

The new jsp file will opened for editing.

File Name : DisplayDate.jsp

```
1. <%@page contentType="text/html" pageEncoding="UTF-8"%>
2. <%@include file= "top.jsp"%>
3. Todays Date is :
4. <% //Scriptlet for initialising and printing date object%>
5. <%   java.util.Date date = new java.util.Date();
6.      out.println(" ");
7.      out.println(date);
8. %>
9. <%@include file= "bottom.jsp"%>
```

Please note that there are two include commands in the jsp file and scriptlet code for printing the date object. If you want to make any changes in the menu options, or heading, footer etc., you just need to do so in the top.jsp or bottom.jsp. Please note that line 1 describes the content type for this web page. Line 2 and 9 contains the jsp script to include the top.jsp and bottom.jsp files respectively. Line 3 just displays HTML content. Line 4 is a comment line in jsp. Line 5 initialises a object date of class

Date with the current date and time. Line 6 output a blank line and line 7 prints the date object.

File Name : VisitorCounter.java

```
package JavaPackage;
public class  VisitorCounter
{
        private static int ctr;
        public static int readCounterValue()
        {
                ctr++;
                return ctr;
        }
}
```

This file creates a java class file namely VisitorCounter. This class file is used by the server to store a static variable ctr. The variable ctr is incremented every time the readCounterValue() method of the class is called. This class is used by DisplayCounter.jsp file to keep track of Visitors who click on Visitor No's link. Please note that the first line of this file is package JavaPackage. You need to create this file using the following commands:

File→ New File … A New File window will open

Select ***Java*** in the categories section and ***Java Class*** in the File Types in the New File window and press the Next button. A New Java Class window will open.

In the New Java Class window, type Class Name - *VisitorCounter* and Package *JavaPackage* as shown in Figure 17 and press the Finish button in the button panel.

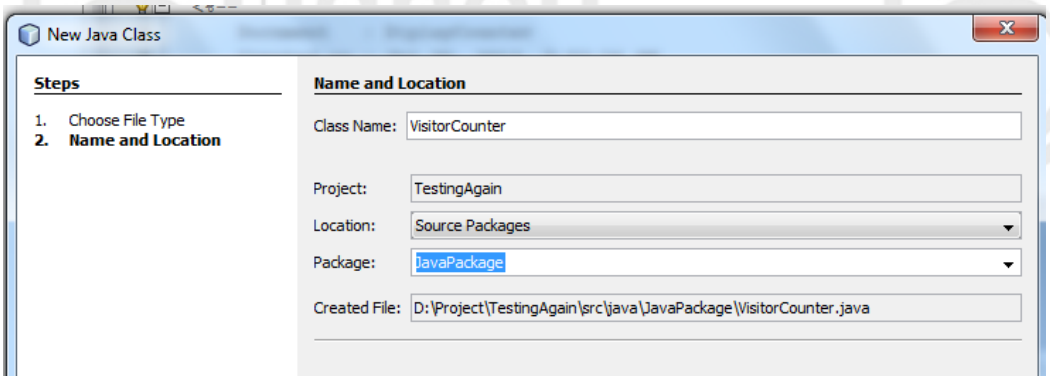


Figure 17: Creating the VisitorCounter class in the package JavaPackage

A new class file with the name VisitorCounter.java will open in the Netbeans editing window. The file will include the following lines:

```
package JavaPackage;
public class VisitorCounter {

}
```

Type the remaining part of the file. Please note this file will be created in folder src—java—javapackage folder as shown in the Figure 18.

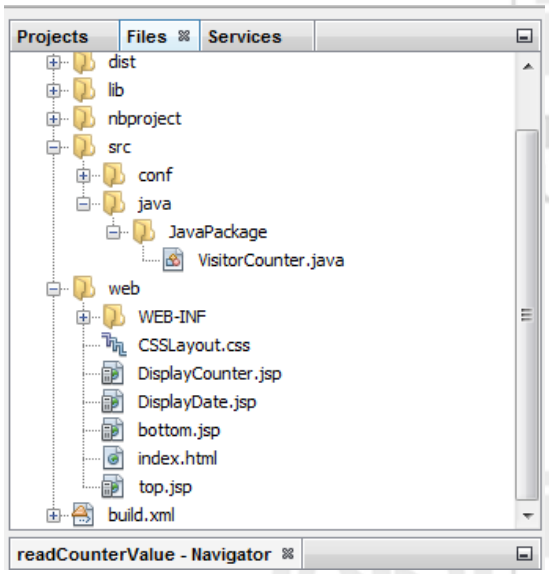


Figure 18: The Files Tab showing all the files

Now, you can create the new jsp file DisplayCounter.jsp

File Name : DisplayCounter.jsp

```
1. <%@page import="JavaPackage.VisitorCounter"%>
2. <%@page contentType="text/html" pageEncoding="UTF-8"%>
3. <%@include file= "top.jsp"%>
4. Your visitor number is :
5. <% out.println(VisitorCounter.readCounterValue());
6. %>
7. <%@include file= "bottom.jsp"%>
```

You need to tell the class name and location of VisitorCounter.java file, line 1 does this task.Line 3 and 7 are for including files. Line 6 calls the method readCounterValue() of VisitorCounter class to display the visitor number.

Once you have created all the files, you can run this project using Run→Run Project option on the Netbeans menu. It will open the browser window as shown in Figure 16. You can click on the three options on the left section and observe the changes in the web pages.

You must be wondering why we have typed the complete content in the index.html? Remember index.html is an html file and NOT jsp file. Therefore, you can not include files in it. If you want to do so, you need to create an index.jsp.

Is the method of including files in jsp files the only method of creating maintainable web sites? No, you can create fragment files having jspf extension and use configuration file which determines in which files these jspfs are to be included. However, these are beyond the scope of this unit and you should go through Netbeans tutorials for more details on these options.

It is a good idea to create a number of folders for a website. For example, images can be put in the image folder, similarly main pages can be put together in a folder, fragments can be put in separate folder. Once again, you are advised to go through Netbeans tutorial especially Netbeans E-commerce tutorial at the web address: https://netbeans.org/kb/docs/javaee/ecommerce/intro.html for more details.

1.6 CREATING DATABASE APPLICATION

So far you have used the Netbeans environment for creating simple JSP programs. However, a good website may need to connect to a backend data server. Some such tasks may involve entering information, checking for login etc. In this section, we will explain, how a database based application can be created using netbeans. For this section, you will also require MySQL database. (You may any database instead of MySQL such as PostgreSQL also). You can download MySQL/PostgreSQL database from their respective web site. You must install the file and create the password for the root.

First let us define the problem that you need to solve in this section. You need to create a Student Information form that stores the information of a student in a database. You are also required to query the database to retrieve programme wise student information. This application requires interfaces and database support. As a first step, you need to analyse and design the problem, however, we have shown here a very simple implementation (without error checks) using JSP. The following sub-sections illustrate this example.

1.6.1 Creating Database and Database connections using netbeans

Once you have successfully installed MySQL client, it will be ready to use. You can connect to it from the Netbeans, using the following:

Open the Netbeans and select the Services tab on the Project pane and click on Drivers. You will see the following in your window:

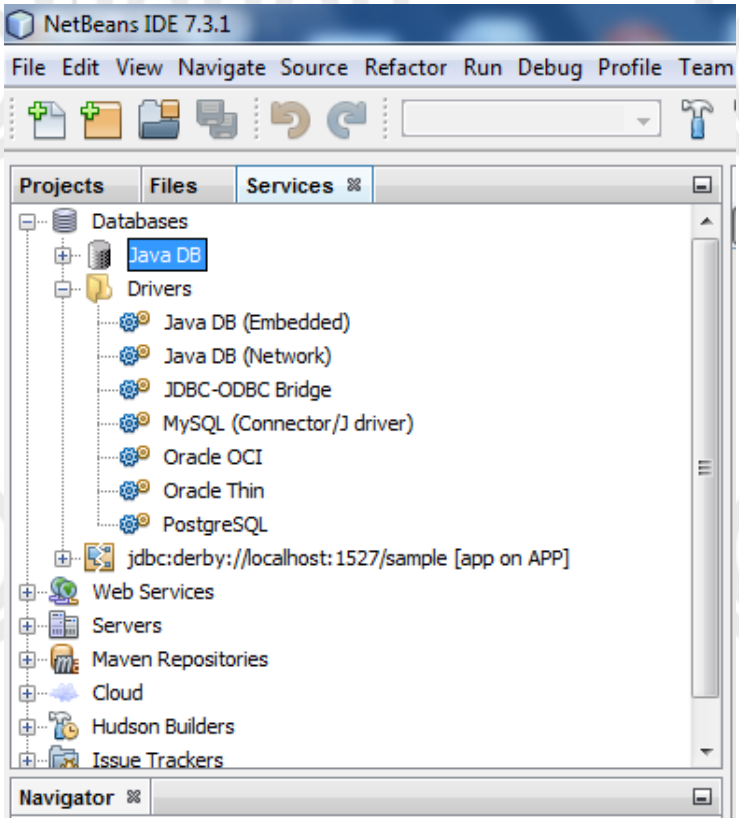


Figure 19: Display of database drivers

The Services tag is highlighted and under the Drivers folder, you can see MySQL (Connector/J driver). (if you are using PostgreSQL then you can use the PostgreSQL driver listed in this window). Right click on the Driver you want to use and select option "Connect Using …", the following window will open:

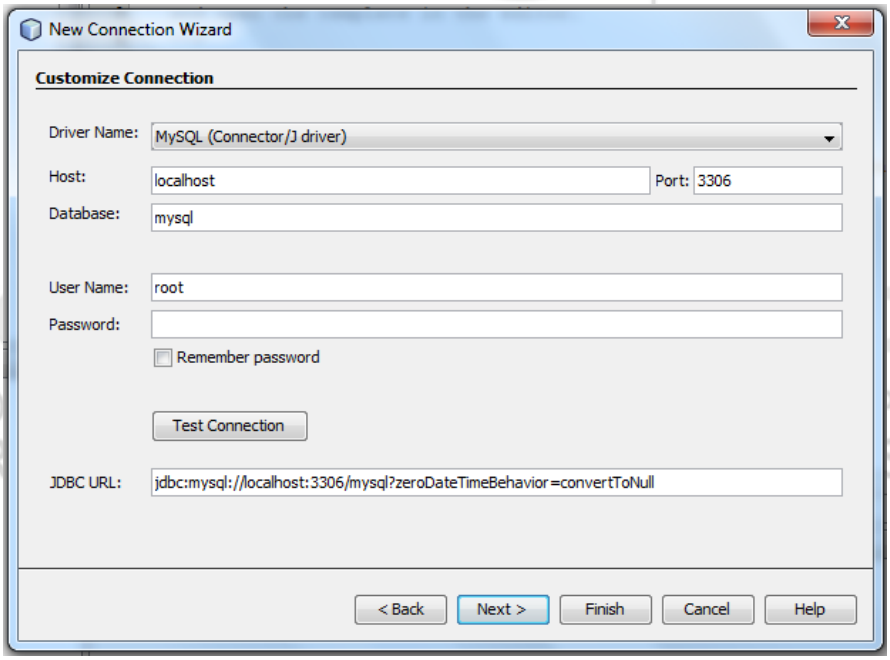


Figure 20: New Database Connection using MySQL

Please note thatin figure 20, user name is already specified as root. You can type in the password in the Password text box, you can also check the Remember password check box, if you want so. Test the connection by pressing the Button "Test Connection". In case your connection is ok, you will see a message "Connection Succeded". Press Finish once you have completed the tasks.

A new MySQL connection with the name will be displayed below the driver folder.

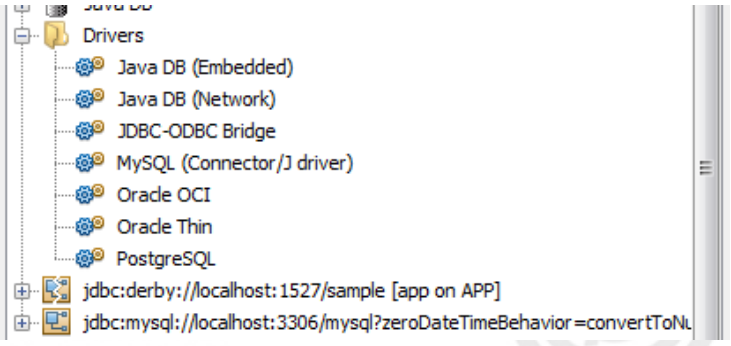


Figure 21: The database connection to default database named mysql

Now, you can run the following SQL commands to create Student database and a new database user named *netbean* having the password *netbean7*. Please note that GRANT command of SQL gives user *netbean* all types of access over the database student.

```
create database Student;
create user 'netbean'@'localhost' identified by 'netbean7';
```

```
grant all on student.* to 'netbean'@'localhost';
```

But how can you run these commands using netbeans?

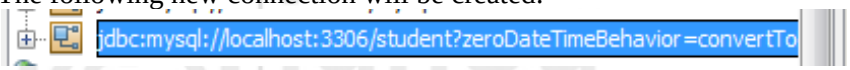
You can Right click on the MySQL connection as shown in figure 21 and select the option “Execute Command …” , a tab with the name “SQL Command 1 will open in the editor window. Type all the SQL commands in that window and press CTRL+SHIFT+E keys to run these SQL commands.

Once you have created the database student, you can create tables in this database. But for this you may have to create a new connection to the student database. You may be wondering why do you need to create this new connection? This will make sure that you work with the students database only. In addition, we also propose that you use different user name and password to for this connection. Why, well the main reason is that the root user has access to every database resource and giving such permission to everyone will be dangerous. Therefore, it may be a good idea to give limited access to user accounts. Please note that *netbean* account only have access to student database only. It can perform all the database creation and manipulation commands (specified by ALL in the grant command) on the database student only.

So, create another MySQL database connection following the same procedure as given earlier, but enter the following in figure 20.

Databse:	*student*
User Name:	netbean
Password:	netbean7

The following new connection will be created:



Now, you can execute the following SQL commands using the new database connection that you have created.

You should execute the following commands to create two tables programme and studentmaster. Please note that in the command Primary key, check constraint and Foreign key constraint has been specified.

```
create table programme (
ProgCode char(5) PRIMARY KEY,
Prname varchar(40) NOT NULL,
NoOfSemester int NOT NULL,
check (NoOfSemester > 0 and NoOfSemester < 15)
);

create table studentmaster (
stID char(9) PRIMARY KEY,
stname varchar(25) NOT NULL,
stphone char(12) NOT NULL,
ProgCode char(10) NOT NULL,
FOREIGN KEY (ProgCode) references programme(ProgCode)
on delete restrict
on update cascade);
```

You can now insert some data in the programme table using the following commands.

```
insert into programme VALUES ("MCA","Master of Computer Applications",6);
```

```
insert into programme VALUES ("BCA","Bachelor of Computer Applications",6);
insert into programme VALUES ("CIT","Certificate in Information Technology",1);
insert into programme VALUES ("MBA","Master of Business Administration",6);
```

1.6.2 Creating Form and Connection using JSTL

Once the database is ready to use, you need to create a JSP form to input student data in the studentmaster table. The form that has been created in this application is shown in the following figure.

Figure 22: Form for Entering Student Information

But how can you create this form? Please note that this is the same web site that you had created in the previous sections. However, you have to add two more options in this web site – *Enter Student Information* and *Student List for a Course*. First to add these options, you need to make changes in the index.html and top.jsp files. In both these files add the following two lines as the last two lines of the <menu> tag:

```
<li><a href="StudentInformationForm.jsp">Enter Student Information</a></li>
<li><a href="CourseStudentList.jsp">Student List for a Course</a></li>
```

Now, you need to create a form - *StudentInformationForm.jsp*. In your project create a new jsp file and name it *StudentInformationForm.* This form has been created using the Palette window of the netbeans and JSTL (JSP Standard Tag Library). Please note that data entry options (Label and Information) has been created using table. The Select Programme is a drop down list. First let us look into the jsp code of the form.

```
1. <%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
2. <%@ taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>

3. <sql:setDataSource var="student" driver="com.mysql.jdbc.Driver"
                      url="jdbc:mysql://localhost/student"
                      user="netbean"  password="netbean7"/>

4. <sql:query dataSource="${student}" var="ProgData">
5.       SELECT ProgCode, Prname from programme;
6. </sql:query>

7. <%@page contentType="text/html" pageEncoding="UTF-8"%>
```

```
8.  <%@include file= "top.jsp"%>
9.  <form name="InputStudentData" action="StudentDataInput.jsp"
    method="POST">
10. <table border="0">
11. <thead>
12. <tr>
            <th>Label</th>
            <th>Information</th>
13. </tr>
14. </thead>
15. <tbody>
16. <tr>
            <td>Student ID :</td>
            <td><input type="text" name="StudentID" value="" size="9" /></td>
17. </tr>
18. <tr>
            <td>Student Name:</td>
            <td><input type="text" name="StudentName" value="" size="25" />
            </td>
19. </tr>
20. <tr>
            <td> Student Phone :</td>
            <td><input type="text" name="StudentPhone" value="" size="12" />
            </td>
21. </tr>
22. <tr>
            <td> Select Programme :</td>
            <td>
            <select name="ProgData">
                <c:forEach var="row" items="${ProgData.rows}">
                    <option value="<c:out value="${row.ProgCode}"/>">
                        <c:out value="${row.Prname}"/>
                    </option>
                </c:forEach>
            </select>
            </td>
23. </tr>
24. </tbody>
25. </table>
26. <input type="submit" value="Submit Information" name="Submit" />
27. </form>
28. <%@include file= "bottom.jsp"%>
```

Let us discuss about the code in more details:

Lines 1 and 2 are typical defining the tag libraries for JSTL. Please note these lines are automatically added when you use Palette for inserting Database code using JSTL.

Line 3 contains code for connecting JSP code that is run on the web server to database server. The connection establishment as discussed in the previous sub-section connects netbeans to database. But when you are running a web application involving JSP, the JSP code is run at the web server (localhost:8080 is the address for the local Glassfish server that we are using in the Netbeans project). This server code is to be connected to the database server (which is also MySQL local host in this case) which has the database. The code at line 3 tells the server which source of data are you using. For the given code the driver to be used is the default SQL JDBC driver named "com.mysql.jdbc.Driver". This tag also informs the web server about the database

name and location, user name and password (in our example, "jdbc:mysql://localhost/student", "netbean" and "netbean7" respectively). Please note that this database connection is attached with a variable name “student” in this lin

Lines 4-6 is the code for the query that is a standard SQL query. This query extracts the ProgCode and Prname from the Programme table. Please observe the data source given here is ${student} which refers to variable, i.e. student, that you have created in line 3. This statement also specified a new variable name ProgData which will be assigned the output of the query when it is run.

Line 7 defines the content type of this JSP page.

Line 8 and 28 includes the top.jsp and bottom.jsp files in the code.

Line 9 typically identifies the form and the file that will be executed when submit button is pressed. The method used to transfer parameter is POST in this case.

Line 11-25 describes various label and input fields such as text box. Line 26 creates the Submit Information button. Line number 22 needs some more discussion. The HTML code for the Drop Down List of Programme as can be seen in the page source of the browser is:

```
<select name="ProgCode">
        <option value="BCA"> Bachelor of Computer Applications</option>
        <option value="CIT"> Certificate in Information Technology</option>
        <option value="MBA"> Master of Business Administration</option>
        <option value="MCA"> Master of Computer Applications</option>
</select>
```

While the JSP code is:

```
<select name="ProgData">
        <c:forEach var="row" items="${ProgData.rows}">
                <option value="<c:out value="${row.ProgCode}"/>">
                        <c:out value="${row.Prname}"/>
                </option>
        </c:forEach>
</select>
```

The first and last lines of both the codes are identical. The JSP code contains for each loop that processes all the output provided as a result of execution of query in lines 4-6. The query produces the result:

Prog Code	Prname
BCA	Bachelor of Computer Applications
CIT	Certificate in Information Technology
MBA	Master of Business Administration
MCA	Master of Computer Applications

<c:forEach var="row" items="${ProgData.rows}"> is a JSTL tag. It selects rows of the query variable ProgCode one by one, for example, it will first extract the row of BCA.

<option value="<c:out value="${row.ProgCode}"/>"> is an HTML tag which contains a JSTL tag <c:out ……/>. The HTML tag output the content:

<option value="

Next the JSTL tag <c:out value="${row.ProgCode}"/> executes and produces the ProgCode (the SQL field name) of the first row. This happens to be BCA. Thus, the output is:

BCA

Finally the last portion "> produces the output

">.

Thus, this line produces the tag:

<option value="BCA">

The line <c:out value="${row.Prname}"/> for the first row simply produces the output:

Bachelor of Computer Applications

The last line produces the output:

</option>

So when you put together the output of the all these three rows together you get the HTML code:

<option value="BCA"> Bachelor of Computer Applications</option>

Which is the first line of HTML code of the browser.

Please note that the JSP code is repeated for each row of the data output as shown in the table, thus, creating the complete HTML code of Select options.

But how do you create this file using Netbeans. Perform the following steps:

Create a new JSP file, give it a name *StudentInformationForm*

In the page so created by Netbeans, remove all the contents after the <page …> tag and insert the two include tags including top.jsp and bootom.jsp

Between these two include insert a form using Palette (in case you cannot see palette window then press CTRL+SHIFT+8). From the HTML Forms portion of palette drag *Form* between the two include tags. The following insert form window will appear. Insert the file name that processes the form in this case it is *StudentDataInput.jsp*. Select method to POST and give it a name and click OK button.

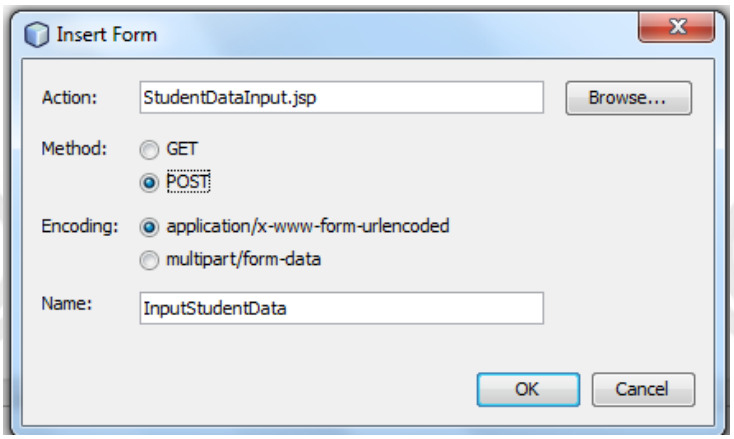


Figure 23: The Insert Form Window

The form opening and closing tags will appear between the two include tags. Now you can insert a table between the two form tags to create various input

options (except the select options). You can also type in the code from the lines 10 to 26 except the line 22.

Now, you need to insert the HTML code given at line 22. Place your cursor between the code of line 21 and 23 and create type

```
<tr>
    <td> Select Programme :</td>
    <td>
    <select name="ProgCode">
        <option value="BCA">
                Bachelor of Computer Applications
        </option>
    </select>
    </td>
```

Please note the *BCA* and *Bachelor of Computer Applications* are to be replaced by JSP code which will make sure all the progrrammes are included in the drop down list. But in which database source programme data is available? As indicated earlier this data is available in MySQL database *student* in *the programme* table. You have already established a connection with the database along with user name and password. So enter all this information at line 1 of your JSP program. Enter the following information at line 1 of this JSP file.

```
<sql:setDataSource var="student" driver="com.mysql.jdbc.Driver"
                   url="jdbc:mysql://localhost/student"
                   user="netbean"  password="netbean7"/>
```

Once you have informed about the connection and database, you will have to write a query that will list various programme codes and programme names. The query in SQL for this purpose is:

```
SELECT ProgCode, Prname from programme;
```

Using this data a programme name drop down list is to be created, but for this list the data that is being passed through POST method will be the ProgCode such as BCA, MCA only. You need to write JSP code that performs this task. The data for this purpose will be retrieved as a collection of rows (one row for each course) and columns (two columns ProgCode and Prname).

Put your cursor after the *select* tag and from the Database section of the Palette select and drag DBReport. The following window will open:

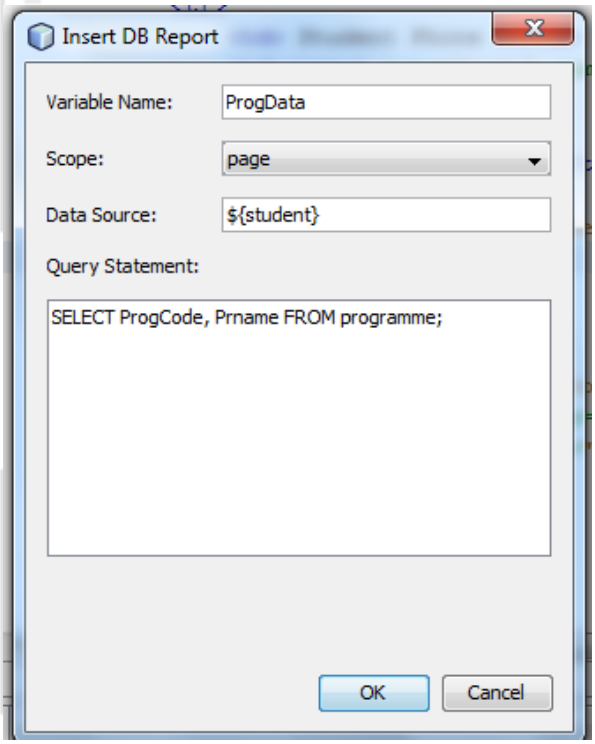


Figure 24: Inserting Database report for Programme code and name

Enter the required data as shown and press OK. Why did you enter Data Source as ${student}? You may check the data source tag that you created in the previous step, the name of the variable given is *student.* To access this variable you need to enclosed it in${name of the variable}.

Please note that two new tags <taglib …> has been added at line 1and 2 of the JSP file and a new query tag has been created with the required query. Cut and put this query after the setDataSource tag (this is being done just to put all related instructions together – no technical reason).

You will find the following code also has been added. Since you are not interested in the column headers and table tags. Therefore you need to delete them. We have shown that code using strikeout font type:

~~<table border="0">~~
~~<!-- column header -->~~
~~<tr>~~
~~<c:forEach var="columnName"~~
~~items="${ProgData.columnNames}">~~
~~<th><c:out value="${columnName}"/></th>~~
~~</c:forEach>~~
~~</tr>~~
~~<!-- column data -->~~
<c:forEach var="row" items="${ProgData.rowsByIndex}">
~~<tr>~~
<c:forEach var="column" items="${row}">
~~<td>~~<c:out value="${column}"/>~~</td>~~
</c:forEach>
~~</tr>~~

```
                    </c:forEach>
                </table>
```

However, we have to create code that is equivalent to code (it is to be repeated for every programme.):

```
<option value="BCA">
    Bachelor of Computer Applications
</option>
```

Therefore, we must keep the outer for each loop, with only the change that we want data by rows. However, the inner loop should contain option tags, therefore, you can replace the inner loop by the option code as given above. So the new code line is:

```
<c:forEach var="row" items="${ProgData.rowsByIndex}">
    <option value="BCA">
        Bachelor of Computer Applications
    </option>
</c:forEach>
```

Now, the term BCA is actually programme code which is stored in ProgCode part of variable row. This will be replaced by <c:out value="${${ row.ProgCode}"/>, likewise the Bachelor of Computer Applications will be replaced by <c:out value="${${ row.Prname}"/>. Thus, you will get the following code.

```
<select name="ProgData">
    <c:forEach var="row" items="${ProgData.rows}">
        <option value="<c:out value="${row.ProgCode}"/>">
            <c:out value="${row.Prname}"/>
        </option>
    </c:forEach>
</select>
```

Now, you form is ready and you can test it, to get the display as shown in figure 22. In the next section, we describe the process of processing the form data and entering it in SQL database.

1.6.3 Storing Student information in the Database

The next step will be input the information submitted by the student into the SQL student database. The file that will process the form data has been specified in the <form …> tag itsel. This content of this file is given below:

StudentDataInput.jsp

```
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@ taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>

<sql:setDataSource var="student" driver="com.mysql.jdbc.Driver"
        url="jdbc:mysql://localhost/student"
        user="netbean"  password="netbean7"/>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@include file= "top.jsp"%>

<sql:update var="insert" dataSource="${student}">
  INSERT INTO studentmaster (stID,stname,stphone,ProgCode)
  VALUES(?,?,?,?);
  <sql:param value="${param.StudentID}" />
  <sql:param value="${param.StudentName}" />
  <sql:param value="${param.StudentPhone}" />
  <sql:param value="${param.ProgCode}" />
```

```
</sql:update>

<sql:query var="studentmaster" dataSource="${student}">
   SELECT * FROM studentmaster WHERE stID = ? <sql:param
value="${param.StudentID}" />;
</sql:query>

The Record Entered by you is:
<table border="1">
   <!-- column headers -->
   <tr>
      <th>Student ID</th>
      <th>Student Name</th>
      <th>Phone Number</th>
      <th>Programme Code</th>
   </tr>
   <!-- column data -->
   <c:forEach var="row" items="${studentmaster.rowsByIndex}">
      <tr>
         <c:forEach var="column" items="${row}">
            <td><c:out value="${column}"/></td>
         </c:forEach>
      </tr>
   </c:forEach>
</table>
<%@include file= "bottom.jsp"%>
```

You should create all the components of the file as explained in the previous sub-section. The portion of the this jsp program that needs explanation is the SQL statement itself. Please note the use of question marks (?) in the VALUES clause, followed by *<sql:param …>* tags. There are four VALUES clauses and thus four *<sql:param …>* tags. You may observe that the parameters used in *<sql:param …>* tags are *${param.StudentID}, ${param.StudentName}, ${param.StudentPhone} and ${param.ProgCode}* conforming to the name fields of the input tages of the form StudentInformationForm.jsp. The names of these fields are *StudentID*, StudentName, StudentPhone and ProgCode respectively. Thus, the data of the form is transferred through the Insert statement to the studentmaster table of the student database. Once data is entered in the database, then the second query displays the content entered for this student. Thus, after filling up the form and submitting it through Submit Information Button, the data will be entered in the database and displayed in the browser window as shown in Figure 25.

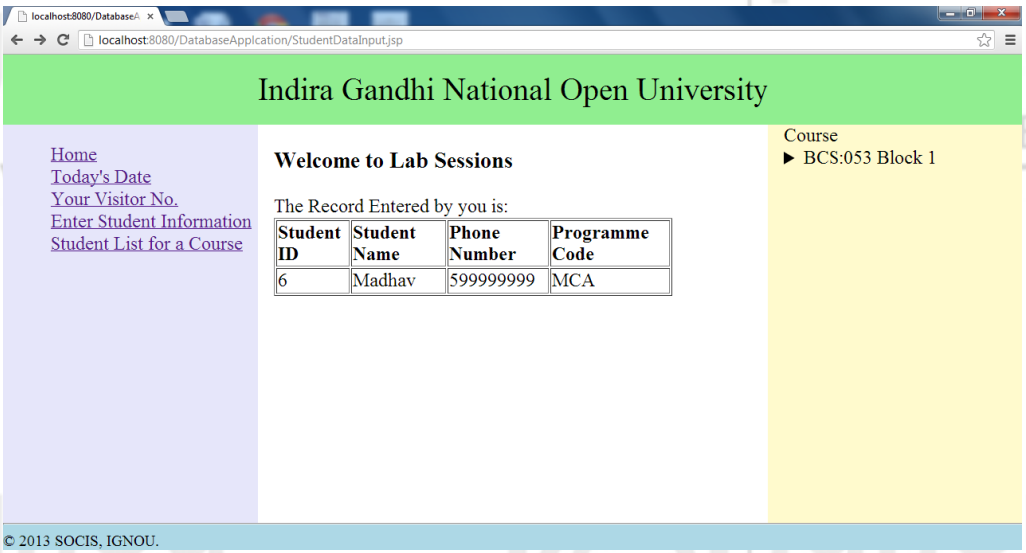


Figure 25: Display of Entered Student Record

You can enter several such records. Now, the final task is to create the list of the students who have enrolled in a programme. Once again, you need to create a form and the action program. The following files contain the code:

CourseStudentList.jsp

```
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@ taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>

<sql:setDataSource var="student" driver="com.mysql.jdbc.Driver"
                   url="jdbc:mysql://localhost/student"
                   user="netbean"  password="netbean7"/>

<sql:query dataSource="${student}" var="ProgData">
   SELECT ProgCode, Prname from programme;
</sql:query>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@include file= "top.jsp"%>
<form name="InputProgramme" action="CourseStudentListProcess.jsp"
method="GET">

   <table border="0">
      <tbody>
      <td> Select Programme :</td>
      <td>
         <select name="ProgCode">
            <c:forEach var="row" items="${ProgData.rows}">
               <option value="<c:out value="${row.ProgCode}"/>">
                  <c:out value="${row.Prname}"/>
               </option>
            </c:forEach>
         </select>
      </td>
      </tr>
      </tbody>
   </table>
   <input type="submit" value="Submit" />
</form>
```

<%@include file= "bottom.jsp"%>

CourseStudentLisProcess.jsp

```
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@ taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>

<sql:setDataSource var="student" driver="com.mysql.jdbc.Driver"
                url="jdbc:mysql://localhost/student"
                user="netbean"  password="netbean7"/>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@include file= "top.jsp"%>

<sql:query var="programmename" dataSource="${student}">
   SELECT Prname FROM programme
   WHERE ProgCode = ? <sql:param value="${param.ProgCode}" />;
</sql:query>


<sql:query var="studentmaster" dataSource="${student}">
   SELECT s.stID, s.stname FROM studentmaster s, programme p
   WHERE s.Progcode = p.ProgCode AND p.ProgCode = ? <sql:param
value="${param.ProgCode}" />;
</sql:query>

<h4>Programme:<br>
   <c:forEach var="progname" items="${programmename.rows}">
      <c:out value="${progname.Prname}"/>
   </c:forEach> (${param.ProgCode})
</h4>
<table border="1">
   <!-- column headers -->
   <tr>
      <th>Student ID</th>
      <th>Student Name</th>
   </tr>
   <!-- column data -->
   <c:forEach var="row" items="${studentmaster.rows}">
      <tr>
         <td><c:out value="${row.stID}"/></td>
         <td><c:out value="${row.stname}"/></td>
      </tr>
   </c:forEach>
</table>
<%@include file= "bottom.jsp"%>
```

You can create these files. The code is not every different to what we have already explained. The following is the browser displays when you execute these files. Please notice that one of the query is from two table.

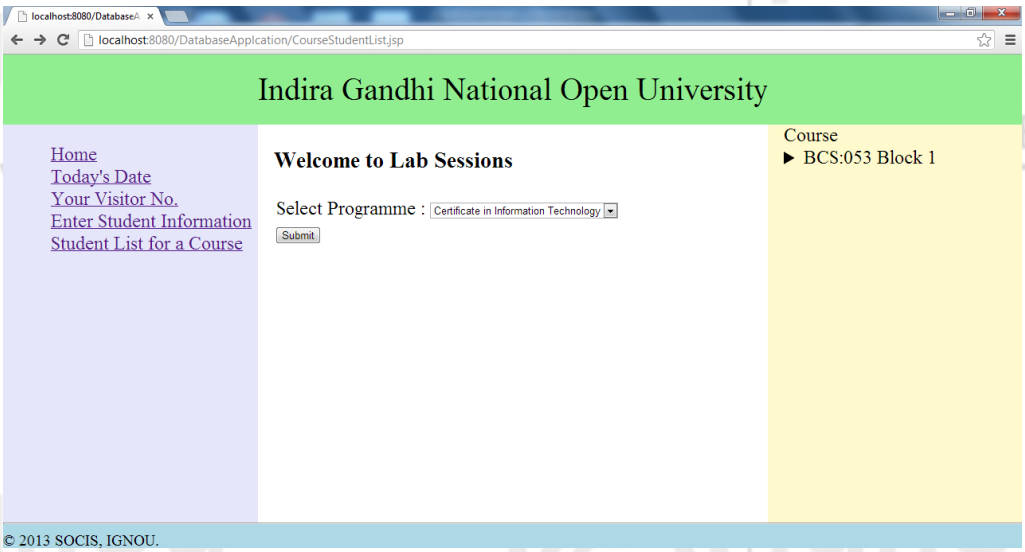


Figure 26: Display on selection of Student List for a Course Option.

The option that is selected is Certificate in Information Technology. Please note that in the file

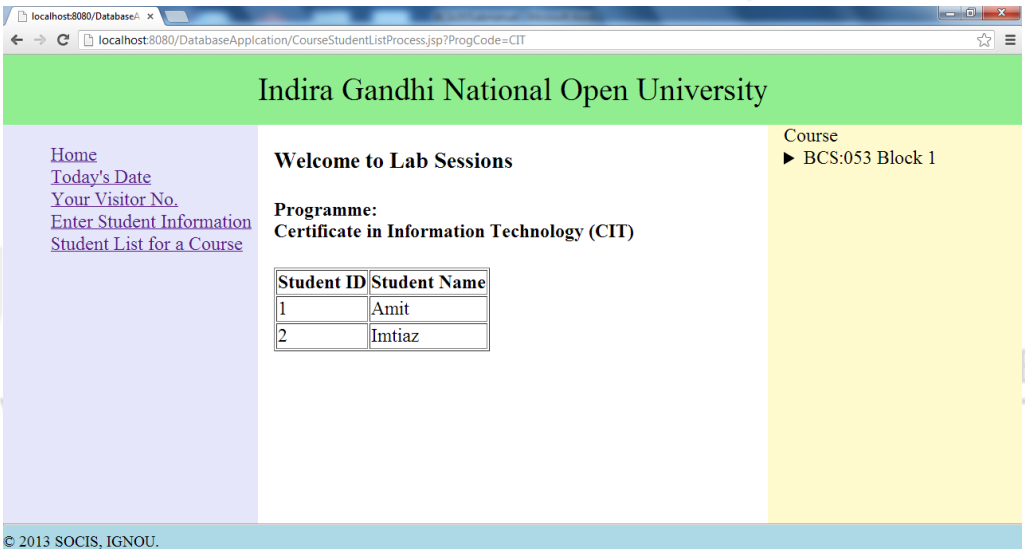


Figure 27: Display of Course List for CIT programme

Thus, you can develop some basic JSP based websites using netbeans using database as the backend. However, you should remember the website developed by us is very elementary and in no way a commercial web site. One of the major problem is that web server does not remember about the users. Therefore, if you are developing e-commerce application, specifically implementing Shopping Cart, you need to remember the users' identity. You can create such applications using sessions and cookies in your applications. For form processing, you can also use Servlets instead of JSP.

Some of the improvements in are developing website are suggested in the next sub-section.

1.6.4 Comments on the Website

The web pages that you have developed during the course of this lab manual can be improved in many ways. Some of the suggestions are given below:

- You may develop and use a professional structure of the web site with images, colours and many more options. This will require an exhaustive study of the requirements and purpose of the web site that you want develop.
- CSS may be further enhanced and you can also use several drop down menus.
- You can use JavaScript for checking form validations.
- You must perform through check on the data filled by the user by using automated ways. You may also check if data is being send by a proper user or not.
- You may add various error checks and exception handling.
- You may use servlets instead of JSP for form validations.
- You may use configuration files of Netbeans which keep track of connections.
- You may use XML and file Fragments to include HTML code in web pages.
- You may use connection pools that can enhance efficiency of web site access.
- You may use entity classes, javabeans and persistence classes of Java to enhance efficiency of access.
- You may organize web site in folders for better maintenance.
- You may use some framework for creating a website.
- You can create sessions and cookies in your applications.

There are many more possibilities. Discussion on these topics is beyond the scope of this Unit. But remember a web site designer always keep looking for technologies for better, efficient, maintainable, dynamic web sites. So keep leaning.

Access to Web through Mobile devices

One final point about the development of web sites for mobiles, you have been introduced in theory to WML. However, that is now an old technology for development of mobile based web sites. A new initiative called Mobile Web Initiative (MWI) has been set by World Wide Web Consortium (W3C). This initiative is aimed at developing the good practices and tools for the access of WWW through mobiles. The small screen sizes, speed, lack of multiple windows are only some of the many limitations of web access through mobile. If you notice the current trends, then you may observe that if you are accessing some good websites through mobiles, the web address is automatically prefixed with "*m.*" indicating that the information being displayed on the mobile device is from the website specially designed for mobiles. Thus, the present practice is to design a simpler website for the mobile, mostly using simpler tags and having limited information for the web pages. In the present, case you are advised to design simpler websites using jsp, servlets for display on mobile devices. Thus, the WML section of web site design is merged with the Section 9 and 10. You are advised to use either WML or design simpler web pages for the mobile access.

1.7 LIST OF LAB ASSIGNMENTS

Session 1: Using Web 2.0 and creating pages using XHTML

1. List the features of at least 5 Web 2.0 technologies.
2. Create a simple website about you. The website should contain at least two tothree pages about you. It should have a table, a menu and some photographs. You should try to create an image map in your website. You should demonstrate the use of summary tags, headings, colours etc.

3. Create a feedback form for the website that you have created. Do not create the action button. Your form should have all possible types of form input options.

4. Create a form for data entry for the marks of the students of a class. Identify the requirements for such a form by collecting few sample mark lists and then design and implement it.

Session 2: Creating Style Sheets for the web pages created in session 1

1. In the HTML pages that you have designed in Session 1, create several divisions. Identify some classes such that alternative rows of a table have different shading. The background colour of each division should be different. Some text should have different display colour and background.
2. Insert a CSS for all the forms designed in session 1. The forms should have a image as the background.
3. Create four simple web pages linked together. All the web pages should share a CSS and a drop down Menu that uses CSS and HTML code only. The menu options should be: Home, Departments, Student Support and Contact Us.

Session 3: Creating sample XML document and displaying it

1. Customer list of an organization includes the name of customers, their Home or permanent addresses, and at least two phone numbers. Create a customer list of at least four customer using XML.

2. Create the DTD for the customers you created in problem 1.

3. Create an XML document to that stores data as XML document, checks it using XML schema and displays the information as shown in the table below:

Subject	Programme	Name of Students
Database Systems	MCA	Ramesh Riaz
Advanced Operating System	M.Tech	Sandeep Cristopher Salim
Web Programming	BCA	Farhin Rajan

4. Create a database of books titles, authors, year of publication, publisher name, price and number of copies purchased using XML. The list should have at least 10 books and every book must have at least one author. Create the XML schema for this books data.

Session 4 and 5: Using and writing JavaScript in web pages

1. Write a JavaScript program that displays a Drop Down Menu
2. Write a JavaScript program that creates a sequence of automatically changing pictures on a web page.
3. Write JavaScript code to check if data has been properly entered in the forms you have created so far. This activity may be performed when you press the Check Button that you may create on each form.
4. Write a JavaScript program that displays the current time and updates it after every minute.
5. Write a JavaScript program that counts the number of times a Button is clicked.

6. Create a web page with two pictures. Write a JavaScript program that displays the description of the picture when mouse is brought over the picture.
7. Write a JavaScript program to demonstrate simple animation on a web page.

Session 6, 7: Using JSP/Servlet

1. Write a JSP/Servlet program that takes your name and address from an HTML Form and displays it on a web page.
2. Write a JSP program that output current time only.
3. Write a JSP program that counts the number of times a link is clicked.
4. Create five pages of a web site having similar top and left panels. The top should have a logo on the left and name of the organization in the middle. The left should have a drop down menu. Use JSP to include it in all the web pages.
5. Create a login form and check if the user name and password entered by the user are correct.
6. Create a quiz of at least five questions and check if the questions have been answered correctly.
7. Write a JSP program that displays "Good Morning" or "Good Evening" based on the present time.

Session 8, 9, 10: Writing simple applications using JSP and JDBC and deploying it on web or mobile devices

1. Create a website using JSP and JDBC that creates employee database of an organization. The employee database has two tables – employee having fields empID, name, department, present designation, present salary, emailed, year of joining the organization, and department having fields department, department name and manager. Create forms to enter information of employees and departments. You must also create a form to display list of employees of a department.
2. Create an application that creates a simple banking database with tables for customers and customer transactions. You must create a login form to verify login details from the customer table. You may create a session or use cookies if possible to perform the transactions.
3. Create a simple Web application for maintaining records of students and teachers in a School. You may study such a system. Make necessary assumptions while developing this application.
4. Design and develop any of the above website for mobile devices.

1.8 FURTHER READINGS

1 https://netbeans.org/
2 http://www.w3schools.com/
3 http://www.oracle.com/
4 www.wikipedia.com/