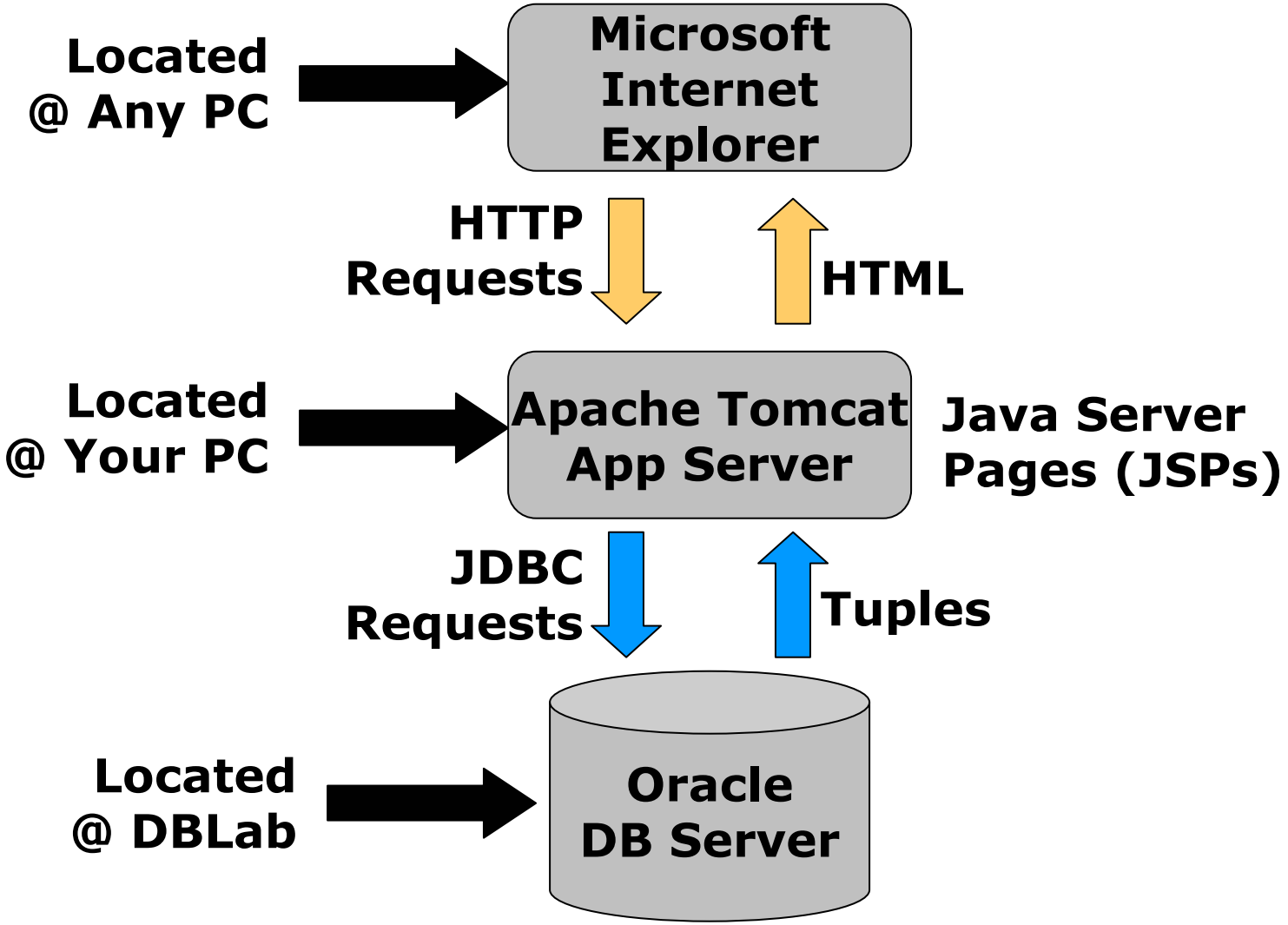
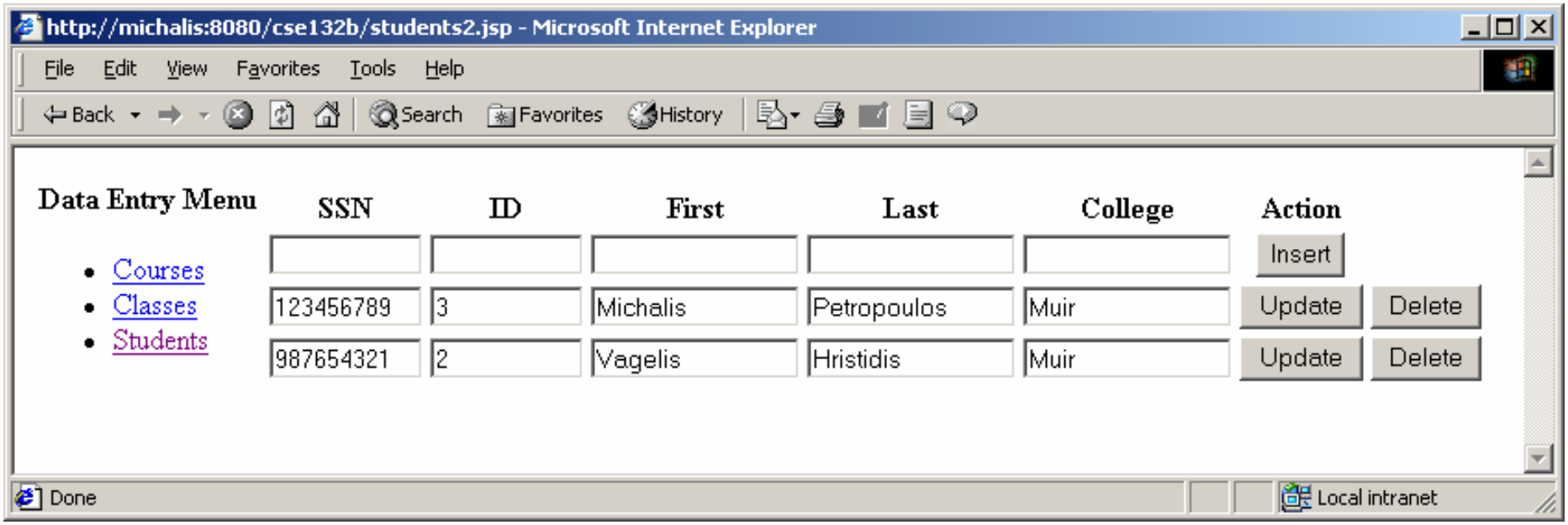
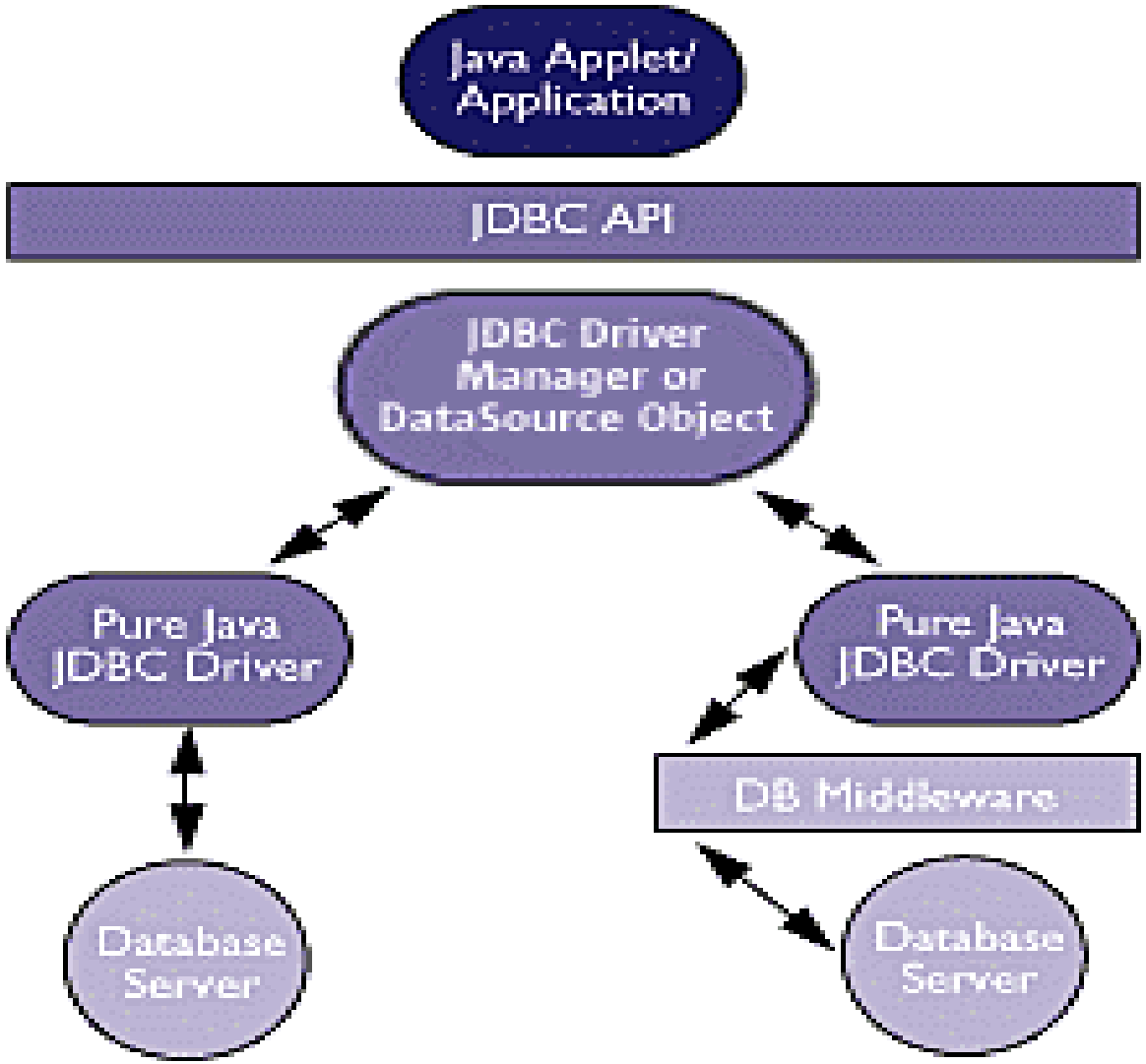
Three-Tier Architecture



Data Entry Forms



Java Database Connectivity (**JDBC**)



JDBC

```
import java.sql.*;

class JdbcTest {
public static void main (String args []) throws SQLException {
 // Load SQLServer driver
DriverManager.registerDriver (new
        com.mssqlsever.jdbc.driver.SQLServerDriver());
// Connect to the local database
Connection conn =  DriverManager.getConnection
        ("jdbc:sqlserver://kebab.ucsd.edu:1433","scott", "tiger");
```

```
 // Query the student names
Statement stmt = conn.createStatement ();
ResultSet rset = stmt.executeQuery ("SELECT name FROM
    Student");
// Print the name out
//name is the 2nd attribute of Student
while (rset.next ())
     System.out.println (rset.getString (2));

//close the result set, statement, and the connection
rset.close();
stmt.close();
conn.close();
```

PreparedStatement Object

If you want to execute a Statement object many times, it will normally reduce execution time to use a PreparedStatement object instead.

```
PreparedStatement updateStud = conn.prepareStatement(
    "UPDATE Student SET name = ? WHERE lastname LIKE
    ?");

updateStud.setString(1, “John”);
updateStud.setString(2, “Smith”);

updateStud.executeUpdate();
```

PreparedStatement Object

the following two code fragments accomplish the same thing:

- Code Fragment 1:

  String updateString = "UPDATE COFFEES SET SALES = 75 " + "WHERE COF_NAME LIKE 'Colombian'"; stmt.executeUpdate(updateString);

- Code Fragment 2:

  PreparedStatement updateSales = con.prepareStatement("UPDATE COFFEES SET SALES = ? WHERE COF_NAME LIKE ? "); updateSales.setInt(1, 75);

  updateSales.setString(2, "Colombian"); updateSales.executeUpdate():

- int getInt(int columnIndex)

  Retrieves the value of the designated column in the current row of this ResultSet object as an int in the Java programming language.
- int getInt(String columnName)
- String getString(int columnIndex)
- String getString(String columnName)

Using Transactions

When a connection is created, it is in auto-commit mode. This means that each individual SQL statement is treated as a transaction and will be automatically committed right after it is executed.

```
conn.setAutoCommit(false);
....
transaction
...
con.commit();
con.setAutoCommit(true);
```

Using Transactions

example

```
con.setAutoCommit(false);
PreparedStatement updateSales = con.prepareStatement( "UPDATE
    COFFEES SET SALES = ? WHERE COF_NAME LIKE ?");
updateSales.setInt(1, 50);
updateSales.setString(2, "Colombian");
updateSales.executeUpdate();
PreparedStatement updateTotal = con.prepareStatement( "UPDATE
    COFFEES SET TOTAL = TOTAL + ? WHERE COF_NAME LIKE ?");
    updateTotal.setInt(1, 50);
updateTotal.setString(2, "Colombian");
updateTotal.executeUpdate();
con.commit();
con.setAutoCommit(true);
```

Retrieving Exceptions

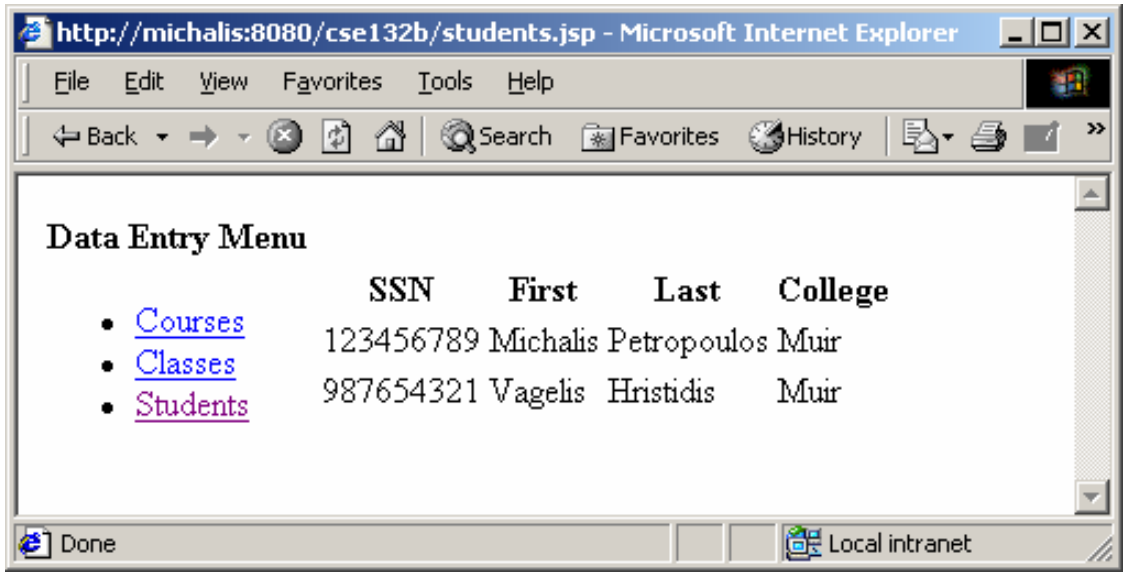
JDBC lets you see the warnings and exceptions generated by your DBMS and by the Java compiler. To see exceptions, you can have a catch block print them out. For example, the following two catch blocks from the sample code print out a message explaining the exception:

```
try {
// Code that could generate an exception goes here.
// If an exception is generated, the catch block below
// will print out information about it.
} catch(SQLException ex) {
System.err.println("SQLException: " + ex.getMessage());
}
```

JSP Syntax

- Comment
  - **<%-- *Comment* --%>**
- Expression
  - **<%= *java expression* %>**
- Scriplet
  - **<% *java code fragment* %>**
- Include
  - **<jsp:include page="*relativeURL*" />**

Entry Form - First Attempt



Entry Form - First Attempt

Menu HTML Code

```
<b>Data Entry Menu</b>
<ul>
    <li>
        <a href="courses.jsp">Courses<a>
    </li>
    <li>
        <a href="classes.jsp">Classes<a>
    </li>
    <li>
        <a href="students.jsp">Students<a>
    </li>
</ul>
```

Entry Form - First Attempt

JSP Code

```
<html>
<body>
    <table>
        <tr>
            <td>
                <jsp:include page="menu.html" />
            </td>
            <td>
                Open connection code
                Statement code
                Presentation code
                Close connection code
            </td>
        </tr>
    </table>
</body>
</html>
```

Entry Form - First Attempt

Open Connectivity Code

```
<%-- Set the scripting language to java and --%>
<%-- import the java.sql package --%>
<%@ page language="java" import="java.sql.*" %>

<%
  try {
    // Load Oracle Driver class file
    DriverManager.registerDriver
    (new oracle.jdbc.driver.OracleDriver());

    // Make a connection to the Oracle datasource
    Connection conn = DriverManager.getConnection
    ("jdbc:oracle:thin:@feast.ucsd.edu:1521:source",
     "user", "pass");
%>
```

Entry Form - First Attempt

Statement Code

```
<%
// Create the statement
Statement statement = conn.createStatement();

// Use the statement to SELECT the student attributes
// FROM the Student table.
ResultSet rs = statement.executeQuery
  ("SELECT * FROM Student");
%>
```

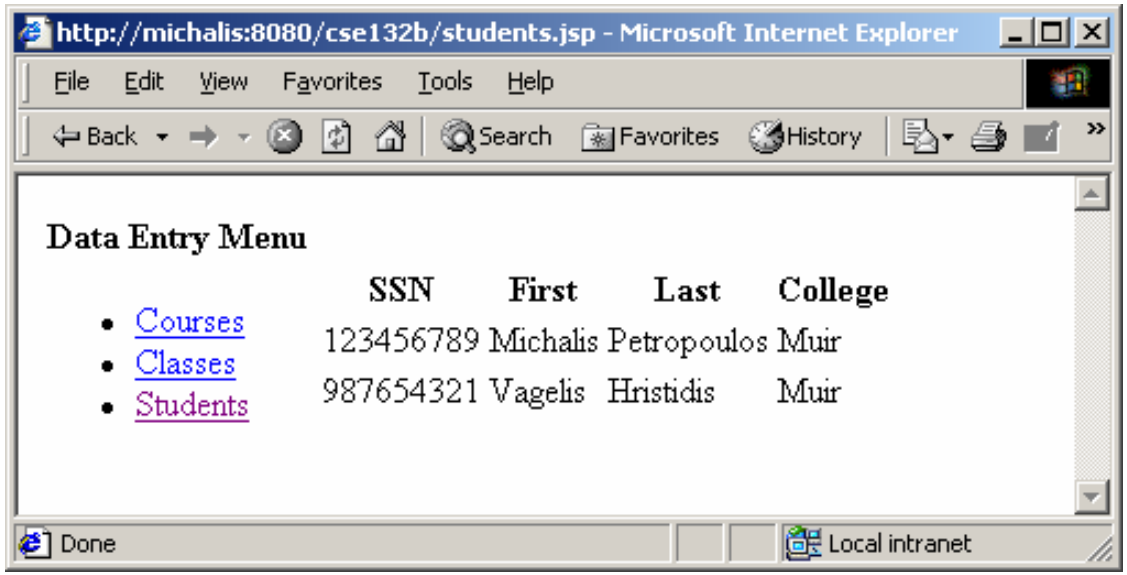
Entry Form - First Attempt

Presentation Code

```
<table>
  <tr>
    <th>SSN</th>
    <th>First</th>
    <th>Last</th>
    <th>College</th>
  </tr>

<%
  // Iterate over the ResultSet
  while ( rs.next() ) {
%>
    Iteration Code
<%
  }
%>
</table>
```

Entry Form - First Attempt



Entry Form - First Attempt

Iteration Code

```
<tr>
  <%-- Get the SSN, which is a number --%>
  <td><%= rs.getInt("SSN") %></td>

  <%-- Get the ID --%>
  <td><%= rs.getString("ID") %></td>

  <%-- Get the FIRSTNAME --%>
  <td><%= rs.getString("FIRSTNAME") %></td>

  <%-- Get the LASTNAME --%>
  <td><%= rs.getString("LASTNAME") %></td>

  <%-- Get the COLLEGE --%>
  <td><%= rs.getString("COLLEGE") %></td>
</tr>
```

Entry Form - First Attempt

Close Connectivity Code

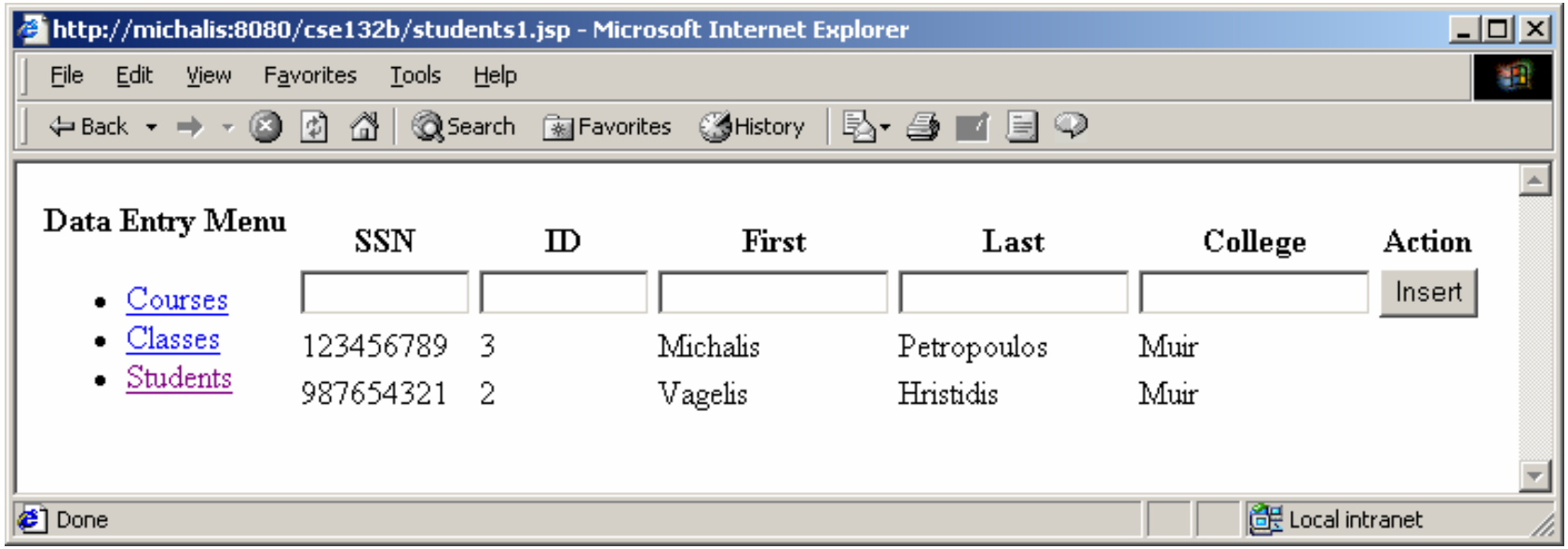
```
<%
// Close the ResultSet
rs.close();

// Close the Statement
statement.close();

// Close the Connection
conn.close();

} catch (SQLException sqle) {
  out.println(sqle.getMessage());
} catch (Exception e) {
  out.println(e.getMessage());
}
%>
```

Entry Form - Second Attempt



Entry Form - Second Attempt

JSP Code

```
<html>
<body>
    <table>
        <tr>
            <td>
                Open connection code
                Insertion Code
                Statement code
                Presentation code
                Close connection code
            </td>
        </tr>
    </table>
</body>
</html>
```

Entry Form - Second Attempt

Insertion Code

```
// Check if an insertion is requested
String action = request.getParameter("action");
if (action != null && action.equals("insert")) {

conn.setAutoCommit(false);

// Create the prepared statement and use it to
// INSERT the student attrs INTO the Student table.
PreparedStatement pstmt = conn.prepareStatement(
("INSERT INTO Student VALUES (?, ?, ?, ?, ?)"));

pstmt.setInt(1,Integer.parseInt(request.getParameter("SSN")));
pstmt.setString(2, request.getParameter("ID"));
…
pstmt.executeUpdate();

conn.commit();
conn.setAutoCommit(true);
}
```

Entry Form - Second Attempt

Presentation Code

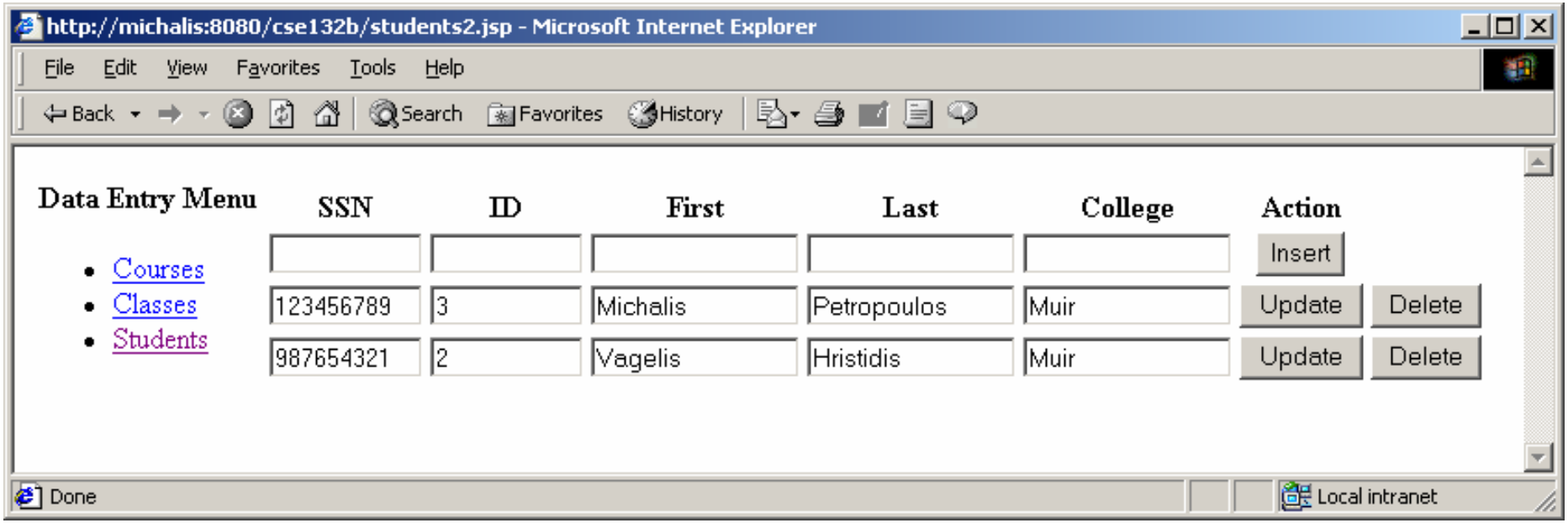
```
<table>
  <tr>
    <th>SSN</th>
    <th>First</th>
    <th>Last</th>
    <th>College</th>
  </tr>
  Insert Form Code
<%
  // Iterate over the ResultSet
  while ( rs.next() ) {
%>
    Iteration Code
<%
  }
%>
</table>
```

Entry Form - Second Attempt

Insert Form Code

```
<tr>
  <form action="students.jsp" method="get">
    <input type="hidden" value="insert" name="action">
    <th><input value="" name="SSN" size="10"></th>
    <th><input value="" name="ID" size="10"></th>
    <th><input value="" name="FIRSTNAME" size="15"></th>
    <th><input value="" name="LASTNAME" size="15"></th>
    <th><input value="" name="COLLEGE" size="15"></th>
    <th><input type="submit" value="Insert"></th>
  </form>
</tr>
```

Entry Form - Third Attempt



Entry Form - Third Attempt

JSP Code

```
<html>
<body>
    <table>
        <tr>
            <td>
                Open connection code
                Insertion Code
                Update Code
                Delete Code
                Statement code
                Presentation code
                Close connection code
            </td>
        </tr>
    </table>
</body>
</html>
```

Entry Form - Third Attempt

Update Code

```
// Check if an update is requested
if (action != null && action.equals("update")) {

conn.setAutoCommit(false);

// Create the prepared statement and use it to
// UPDATE the student attributes in the Student table.
PreparedStatement pstatement = conn.prepareStatement(
"UPDATE Student SET ID = ?, FIRSTNAME = ?, " +
"LASTNAME = ?, COLLEGE = ? WHERE SSN = ?");

pstatement.setString(1, request.getParameter("ID"));
pstatement.setString(2, request.getParameter("FIRSTNAME"));
…
int rowCount = pstatement.executeUpdate();

conn.setAutoCommit(false);
conn.setAutoCommit(true);
}
```

Entry Form - Third Attempt

Delete Code

```
// Check if a delete is requested
if (action != null && action.equals("delete")) {

conn.setAutoCommit(false);

// Create the prepared statement and use it to
// DELETE the student FROM the Student table.
PreparedStatement pstmt = conn.prepareStatement(
"DELETE FROM Student WHERE SSN = ?");

pstmt.setInt(1,
   Integer.parseInt(request.getParameter("SSN")));
int rowCount = pstmt.executeUpdate();

conn.setAutoCommit(false);
conn.setAutoCommit(true);
}
```

Entry Form - Third Attempt

Presentation Code

```
<table>
  <tr>
    <th>SSN</th>
    <th>First</th>
    <th>Last</th>
    <th>College</th>
  </tr>
  Insert Form Code
<%
  // Iterate over the ResultSet
  while ( rs.next() ) {
%>
    Iteration Code
<%
  }
%>
</table>
```

Entry Form - Third Attempt

Iteration Code

```
<tr>
  <form action="students.jsp" method="get">
    <input type="hidden" value="update" name="action">
    <td><input value="<%= rs.getInt("SSN") %>" name="SSN"></td>
    <td><input value="<%= rs.getString("ID") %>" name="ID"></td>
…
    <td><input type="submit" value="Update"></td>
  </form>
  <form action="students2.jsp" method="get">
    <input type="hidden" value="delete" name="action">
    <input type="hidden" value="<%= rs.getInt("SSN") %>"
   name="SSN">
    <td><input type="submit" value="Delete"></td>
  </form>
</tr>
```