JSTL :
JSP Standard Tag Library

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JSP Standard Tag Library (JSTL)

- Encapsulates as tags the core functionality of many Web applications
- Supports tasks such as:
  - Flow (iteration and conditionals)
  - Manipulation of XML documents
  - Internationalization tags
  - SQL tags
- Java EE 1.4 includes both JSP tags and the JSTL
  - JSTL taglibs are included with Rational Application Developer / NetBean IDE

Sample JSTL tags

- Set a variable in a specific scope to a value

```
<c:set var="name" scope="scope" value="expression"/>
```

- Display a value, or an alternative if the first value is null
  - `<c:out value="expr" default="expr" escapeXml="boolean"/>`
  - Example:

```
Hello <c:out value="${user.name}" default="Guest"/>!
```

- Conditional execution

```
<c:choose>, <c:when> and <c:otherwise>


<c:choose>
  <c:when test="${user.role == 'member'}">
    <p>Welcome, member!</p>
  </c:when>
  <c:otherwise>
    <p>Welcome, guest!</p>
  </c:otherwise>
</c:choose>
```

forEach tag

- The forEach tag provides flexible iteration through a set of items, Its targets include:
  - Collections, Maps, Iterators, Enumerations
  - Arrays
  - Comma-separated values (CSV) data
- Example:

```
<table>
  <c:forEach items="${customers}" var=“cust">
    <tr>
      <td>${cust.name}</td>
      <td>${cust.addr}</td>
    </tr>
  </c:forEach>
</table>
```

Exercise

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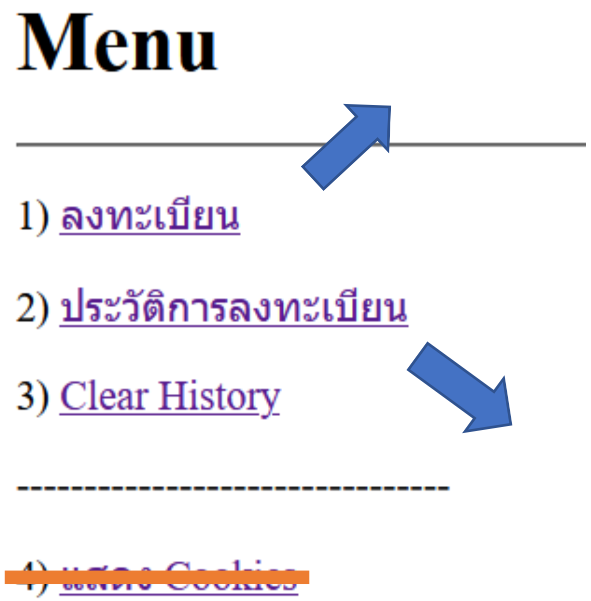


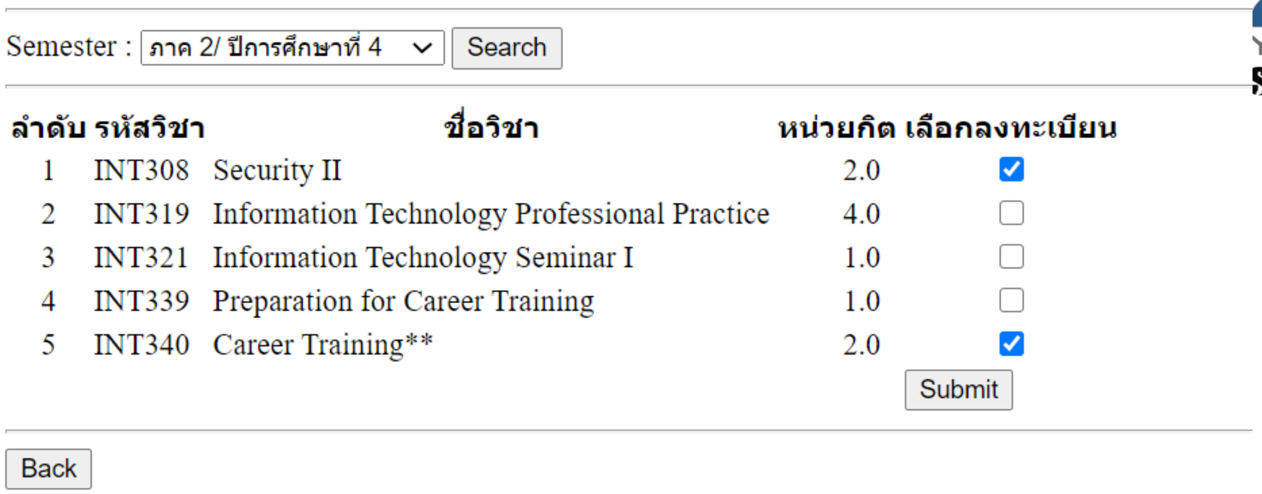
Menu

1) ลงทะเบียน

2) ประวัติการลงทะเบียน

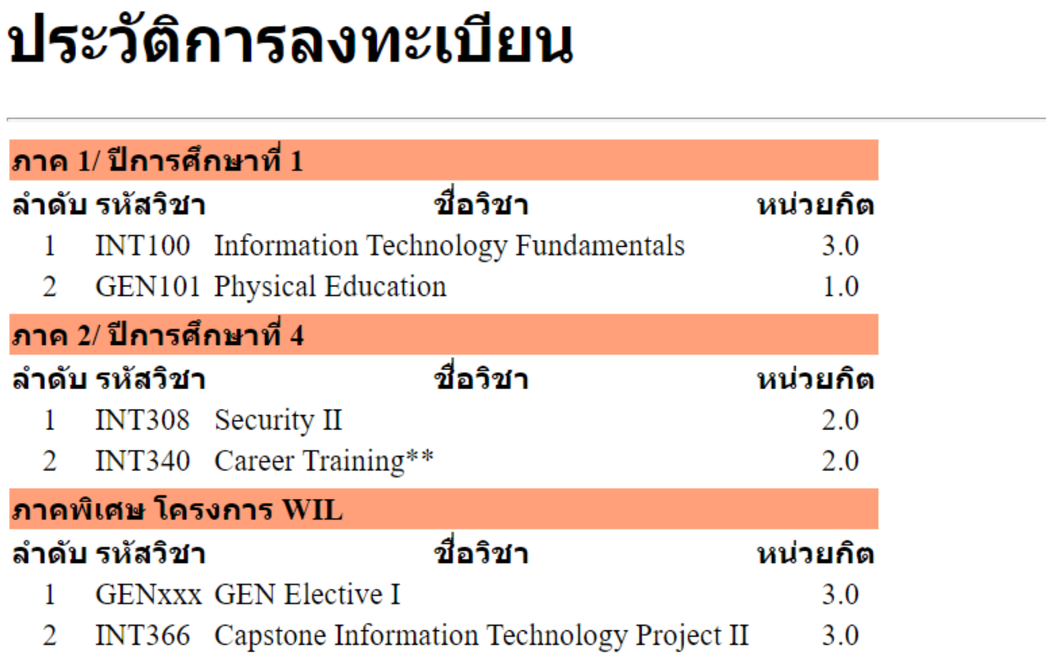
3) Clear History

~~4) แสดง Cookies~~



Semester : ภาค 2/ ปีการศึกษาที่ 4 Search

ลำดับ	รหัสวิชา	ชื่อวิชา	หน่วยกิต	เลือกลงทะเบียน
1	INT308	Security II	2.0	☑
2	INT319	Information Technology Professional Practice	4.0	□
3	INT321	Information Technology Seminar I	1.0	□
4	INT339	Preparation for Career Training	1.0	□
5	INT340	Career Training**	2.0	☑



ประวัติการลงทะเบียน

ภาค 1/ ปีการศึกษาที่ 1

ลำดับ	รหัสวิชา	ชื่อวิชา	หน่วยกิต
1	INT100	Information Technology Fundamentals	3.0
2	GEN101	Physical Education	1.0

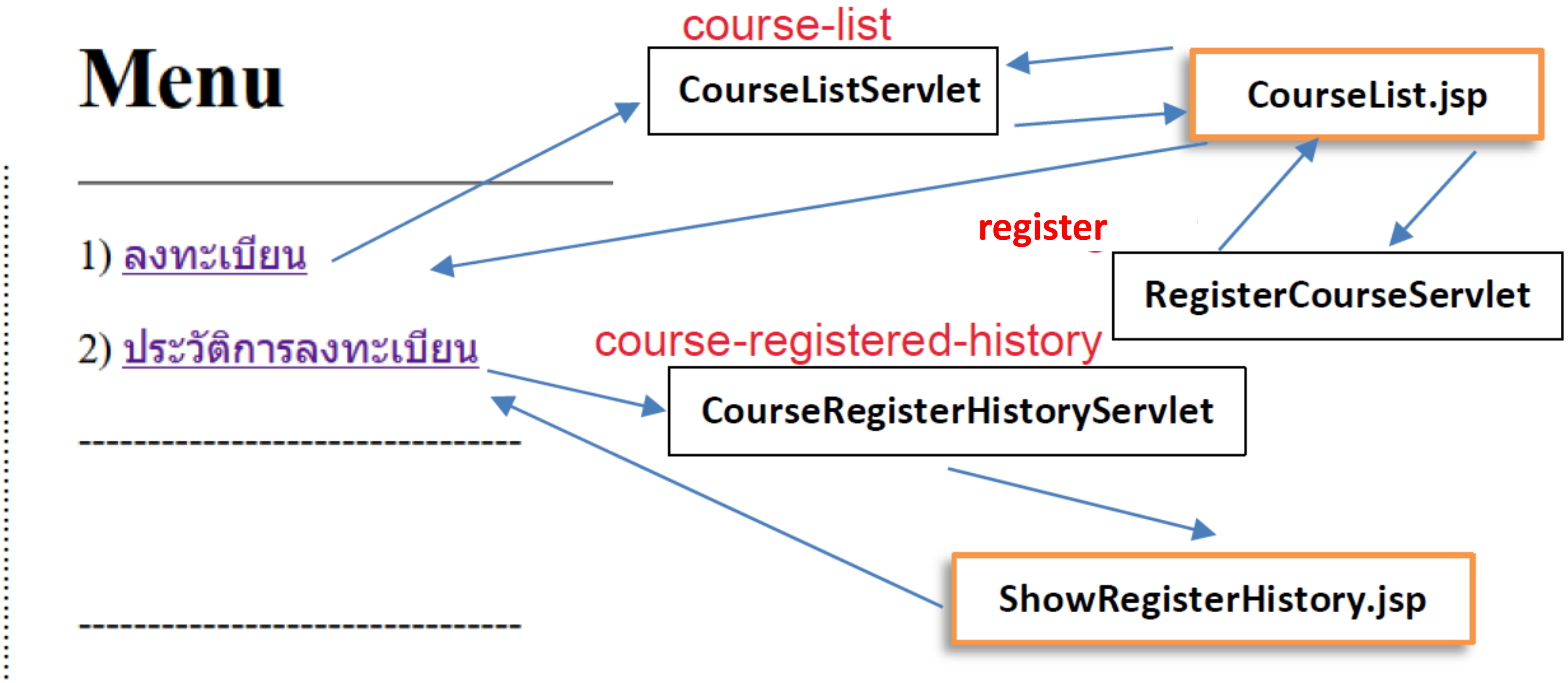
ภาค 2/ ปีการศึกษาที่ 4

ลำดับ	รหัสวิชา	ชื่อวิชา	หน่วยกิต
1	INT308	Security II	2.0
2	INT340	Career Training**	2.0

ภาคพิเศษ โครงการ WIL

ลำดับ	รหัสวิชา	ชื่อวิชา	หน่วยกิต
1	GENxxx	GEN Elective I	3.0
2	INT366	Capstone Information Technology Project II	3.0

URL Mapping



Menu

1) ลงทะเบียน

2) ประวัติการลงทะเบียน

course-list

CourseListServlet

CourseList.jsp

register

RegisterCourseServlet

course-registered-history

CourseRegisterHistoryServlet

ShowRegisterHistory.jsp

Application State Management

The session problem

- Servlets and JSP pages should be stateless
    - They should not have instance variables
    - They support multiple concurrent threads
- Application state information specific to a user must be stored outside of the servlet
    - This is called Session State
    - Determining what to do with it is one of the most challenging problems in servlet programming
    - Session state is session data, and is only used for a set of linked Web pages (your Web application)

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Session strategies: review

- Session state can be stored on either the client or the server
- Examine several session management strategies and figure out where each applies

Client Side

- Cookies
- Hidden Fields
- URL Rewriting

Server Side

- HTTP Session
- Content Based Routing
- Store state in a database
- JWT: JSON Web Token

Cookies

→ เก็บข้อมูลเบื้องต้น ข้อมูลที่ทำให้ user สะดวก shortcup
color Username referant

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- Cookies are a way to place persistent information on the client machine (accessible from the browser)
  - A good way to handle preferences or shortcuts
- Cookies have a name and a value

Cookie API

- Creating cookies
    - Cookie(String name, String value)
- Sending a cookie back to the browser
    - HttpServletResponse.addCookie(Cookie aCookie)
- Retrieving cookies
    - HttpServletRequest.getCookies()
- Retrieving a cookie’s name
    - aCookie.getName()
- Retrieving a cookie’s value
    - aCookie.getValue()
- Changing a cookie's value
    - aCookie.setValue(String)

Cookie usage example

```
public void doGet(HttpServletRequest req, HttpServletResponse res) {
 String userType = "novice";
 Cookie[] cookies = req.getCookies();
 if (cookies != null) {
  for (int i=0; i<cookies.length; i++) {
   if(cookies[i].getName().equals("userType"))
    userType = cookies[i].getValue();
  }
 }
 if (userType.equals("expert"))
   // do expert HTML
 else
  // do novice HTML
}
```

Proper cookie usage

- Because cookies are stored as plain text on the client machine, cookies can be viewed and altered by the client
- Cookies should not be used for information such as:
  - Validation information
  - Secure information (credit card numbers and the like)

Cookie applicability

- Cookies have an expiration date
  - setMaxAge(int expiryInSeconds)
- Default expiration date is -1
  - This means that the cookie is not stored persistently
  - It lasts only as long as the browser is open
- Can restrict the applicable URLs to which a cookie will be sent
  - setDomain(String)
  - setPath(String)

Client data and session tracking with cookies

- Cookies can be made to persist within or across browser interactions
- Cookies are passed to the Web server in the header of the request
- Any updates are passed back in the header of the response
- Session data tracking via HTTP cookies is the most commonly used session tracking mechanism
    - Required to be supported by all Web containers

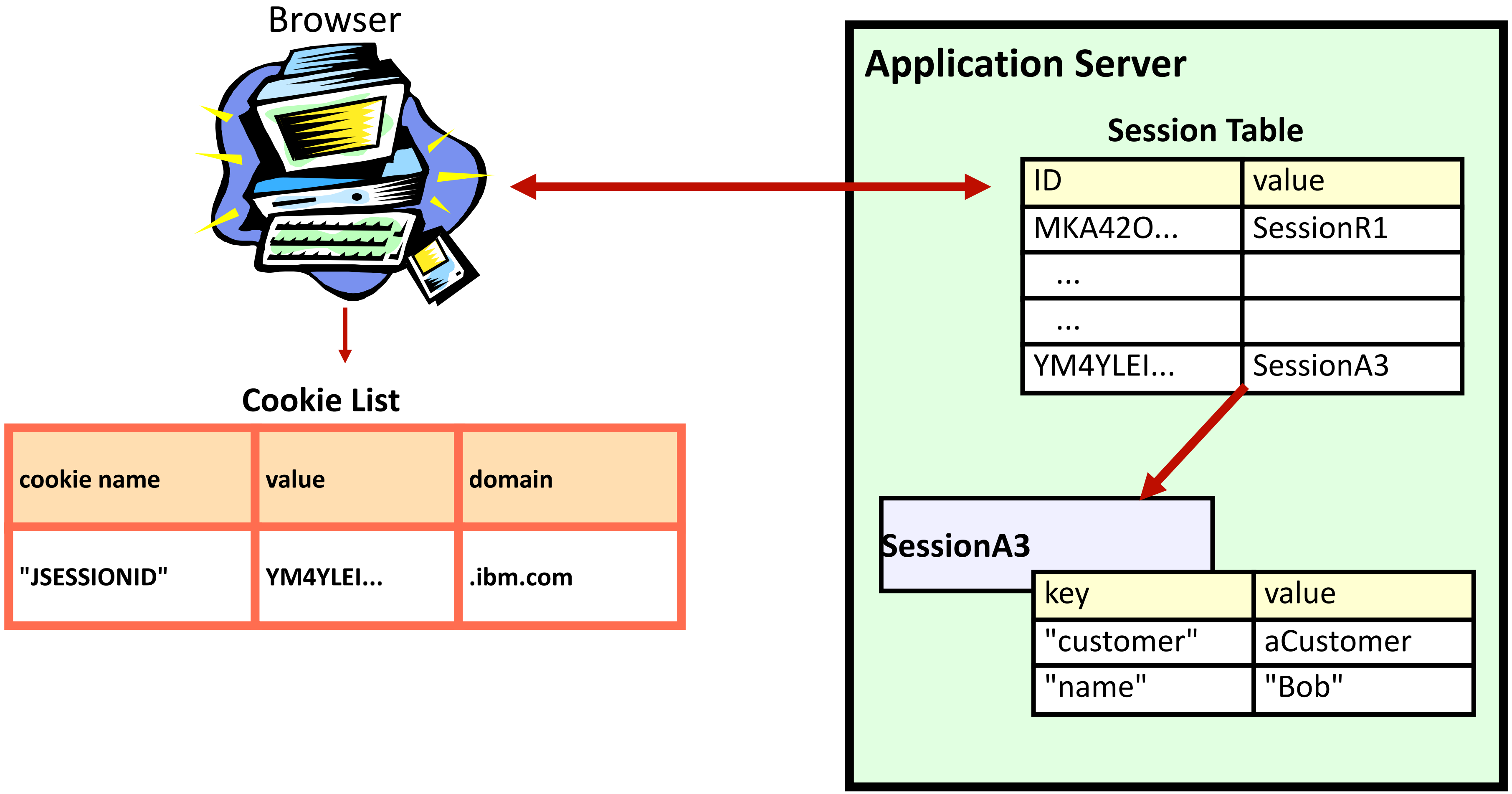
Http Session

- The HttpSession interface, part of the Servlet API, provides an interface for managing application state on the server
- Session Usage:
  - Servlet asks to bind to the Session object representing the current session:
    - A session is requested – request.getSession(boolean create)
    - The method returns the current HttpSession, if it exists
    - If create is true (or no parameter is specified) AND no current Session exists, a newly created session is returned
  - The session is unavailable when:
    - The client browser is closed
    - The session is explicitly invalidated
    - The session times out

HttpSession data store

- HttpSessions store application-specific information
  - Stored as <"key", object> pairs
    - void setAttribute(String, Object)
    - Object getAttribute(String)

Sessions at run time



Browser

Cookie List

cookie name	value	domain
"JSESSIONID"	YM4YLEI...	.ibm.com

Application Server

Session Table

ID	value
MKA42O...	SessionR1
...	
...	
YM4YLEI...	SessionA3

SessionA3

key	value
"customer"	aCustomer
"name"	"Bob"

Session invalidation

- Release HttpSession objects when finished
  - An Application Server can only maintain a certain number of HttpSession objects in memory
- Sessions can be invalidated either programmatically or through a timeout
  - session.invalidate
  - Removes all values from the session
- The session timeout (inactive interval) can be set for the application server as a whole
  - The default timeout is 30 minutes
- Also session.setMaxInactiveInterval(int) can provide session-specific timeout value

Session invalidation example

```
public class ApplicationLogoutServlet extends HttpServlet {
    public void doGet(HttpServletRequest req, HttpServletResponse resp) throws
    ServletException, IOException {

            HttpSession mySession = req.getSession(false);

            // Invalidate session
        if (mySession != null) {
              mySession.invalidate();
            }
            // Perform additional application logoff processing
            // and send output response to browser here
     }
}
```

Session serialization

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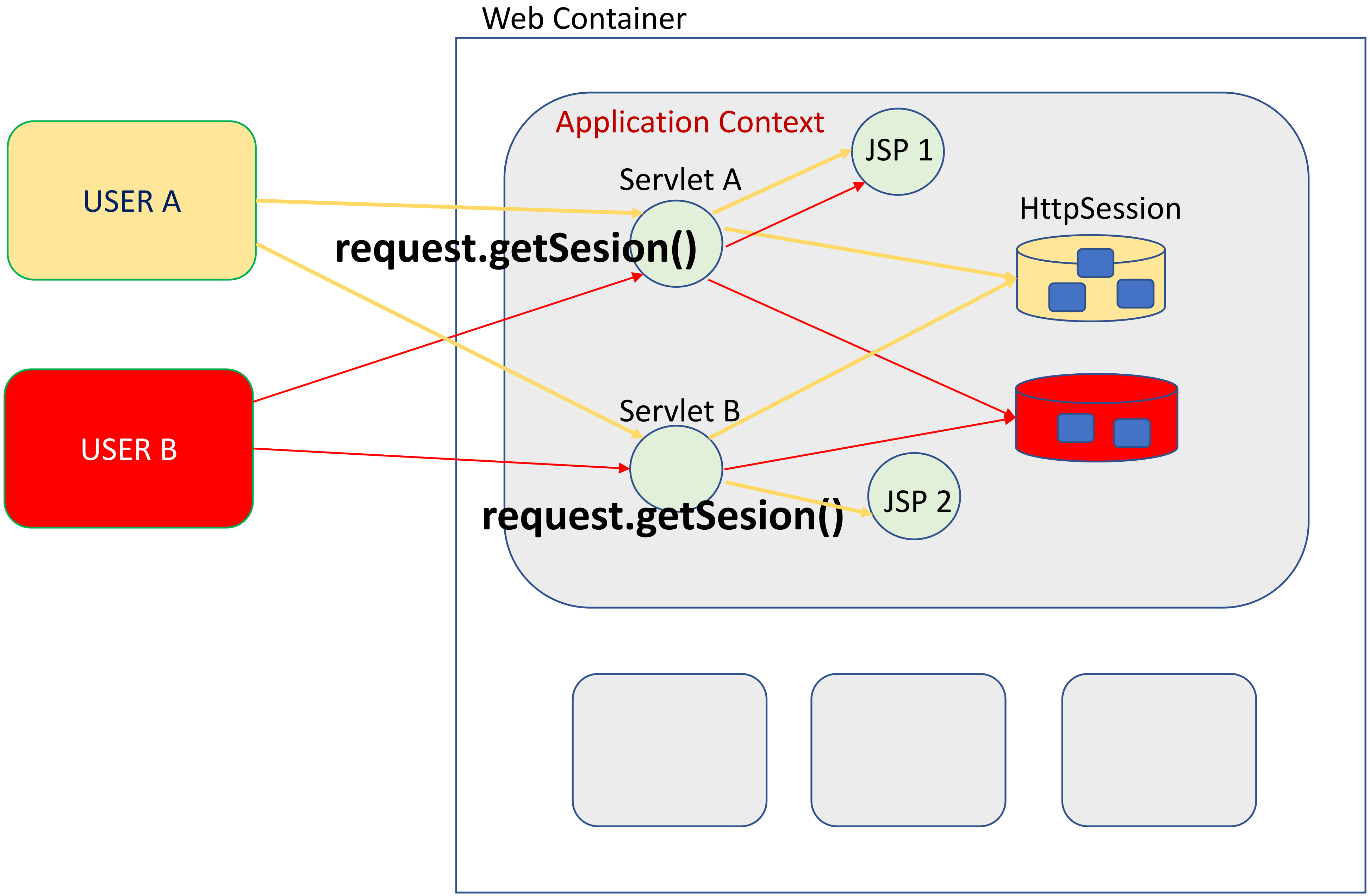
- Objects stored in a session must be serializable:
  - To share between servers in a clustered server configuration
  - For persistence to work
- Make sure that objects reachable from the session are also serializable
- When creating objects to be stored in the session, implement the serializable interface as follows :

```
public class NewObject implements java.io.Serializable {
      ...
}
```



Web Container

Application Context

USER A

USER B

Servlet A

Servlet B

JSP 1

JSP 2

HttpSession

request.getSesion()

request.getSesion()

Excercise

Model

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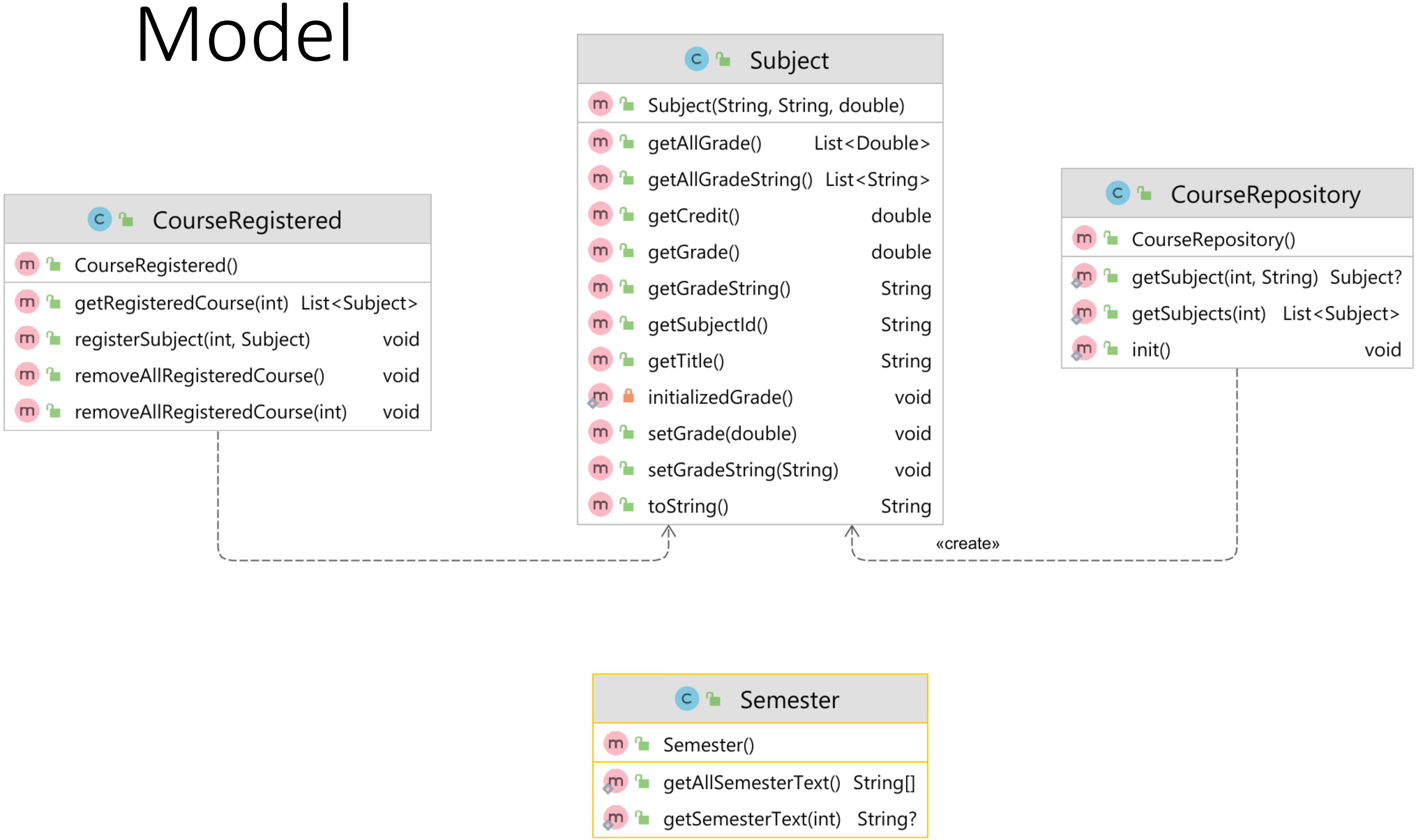


Subject

Subject(String, String, double)	
getAllGrade()	List<Double>
getAllGradeString()	List<String>
getCredit()	double
getGrade()	double
getGradeString()	String
getSubjectId()	String
getTitle()	String
initializedGrade()	void
setGrade(double)	void
setGradeString(String)	void
toString()	String

CourseRegistered

CourseRegistered()	
getRegisteredCourse(int)	List<Subject>
registerSubject(int, Subject)	void
removeAllRegisteredCourse()	void
removeAllRegisteredCourse(int)	void

CourseRepository

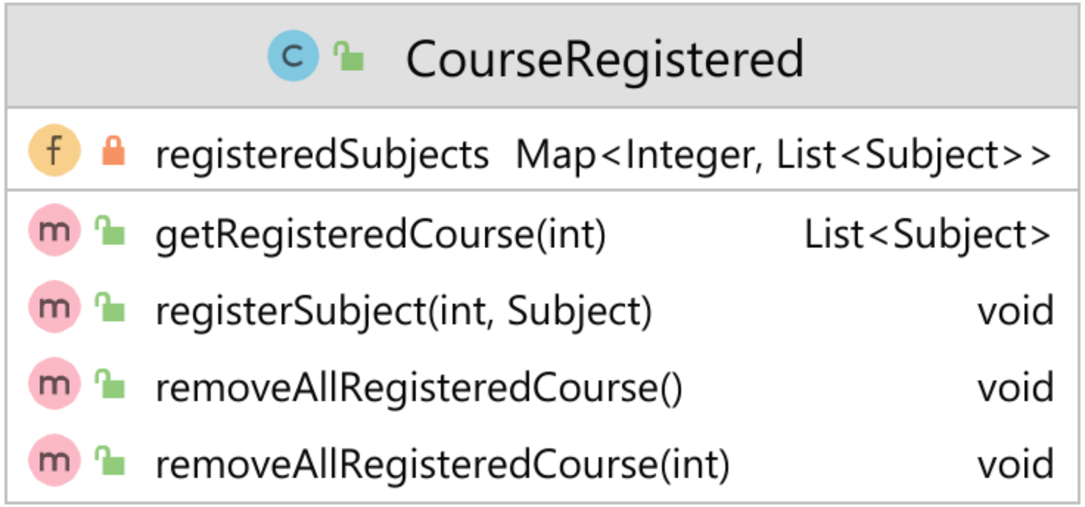
CourseRepository()	
getSubject(int, String)	Subject?
getSubjects(int)	List<Subject>
init()	void

«create»

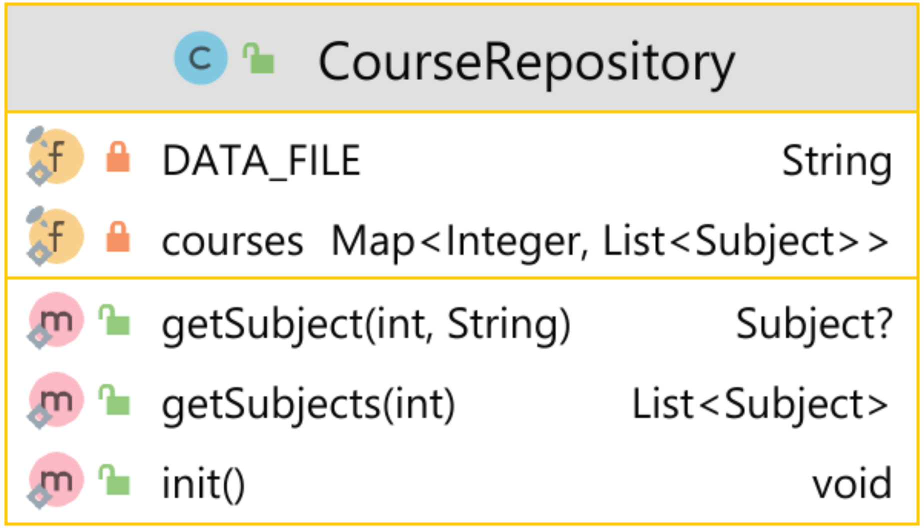
Semester

Semester()	
getAllSemesterText()	String[]
getSemesterText(int)	String?

CourseRegistgered & CourseRepository



	CourseRegistered	
f	registeredSubjects	Map<Integer, List<Subject>>
m	getRegisteredCourse(int)	List<Subject>
m	registerSubject(int, Subject)	void
m	removeAllRegisteredCourse()	void
m	removeAllRegisteredCourse(int)	void



	CourseRepository	
f	DATA_FILE	String
f	courses	Map<Integer, List<Subject>>
m	getSubject(int, String)	Subject?
m	getSubjects(int)	List<Subject>
m	init()	void

ข้อมูลในแต่ละ semester (resources/data.txt)

- Semester: 1

```
INT100 Information Technology Fundamentals   3.0
INT101 Programming Fundamentals              3.0
INT102 Web Technology                        1.0
INT114 Discrete Mathematics for IT           3.0
GEN101 Physical Education                    1.0
GEN111 Man and Ethics of Living              3.0
LNG120 General English                       3.0
LNG220 Academic English                      3.0
```

- Semester: 2

```
INT103 Advanced Programming            3.0
INT104 User Experience Design          3.0
INT105 Basic SQL                       1.0
INT107 Computing Platforms Technology  3.0
INT200 Data Structures and Algorithms  1.0
GEN121 Learning and Problem Solving    3.0
LNG220 Academic English for Science    3.0
```

Semester: 8

INT322 Information Technology Seminar II	1.0
INTxxx INT Elective II	3.0
INTxxx INT Elective III	3.0
LNG304 Meetings and Discussions	1.0
XXXxxx Free Elective II	3.0

Semester: 9

INT372 Experiential Learning Project II	3
INTxxx INT Elective I	3
LNG224 Oral Communication I	3
GENxxx GEN Elective I	3
GENxxx GEN Elective II	3
XXXxxx Free Elective I	3
INT308 Security II	2
INT319 Information Technology Professional Practice	4
INT322 Information Technology Seminar II	1
LNG304 Meetings and Discussions	1
GEN351 Modern Management and Leadership	3
GENxxx GEN Elective II	3
XXXxxx Free Elective II	3

Creating Simple Course Registration App

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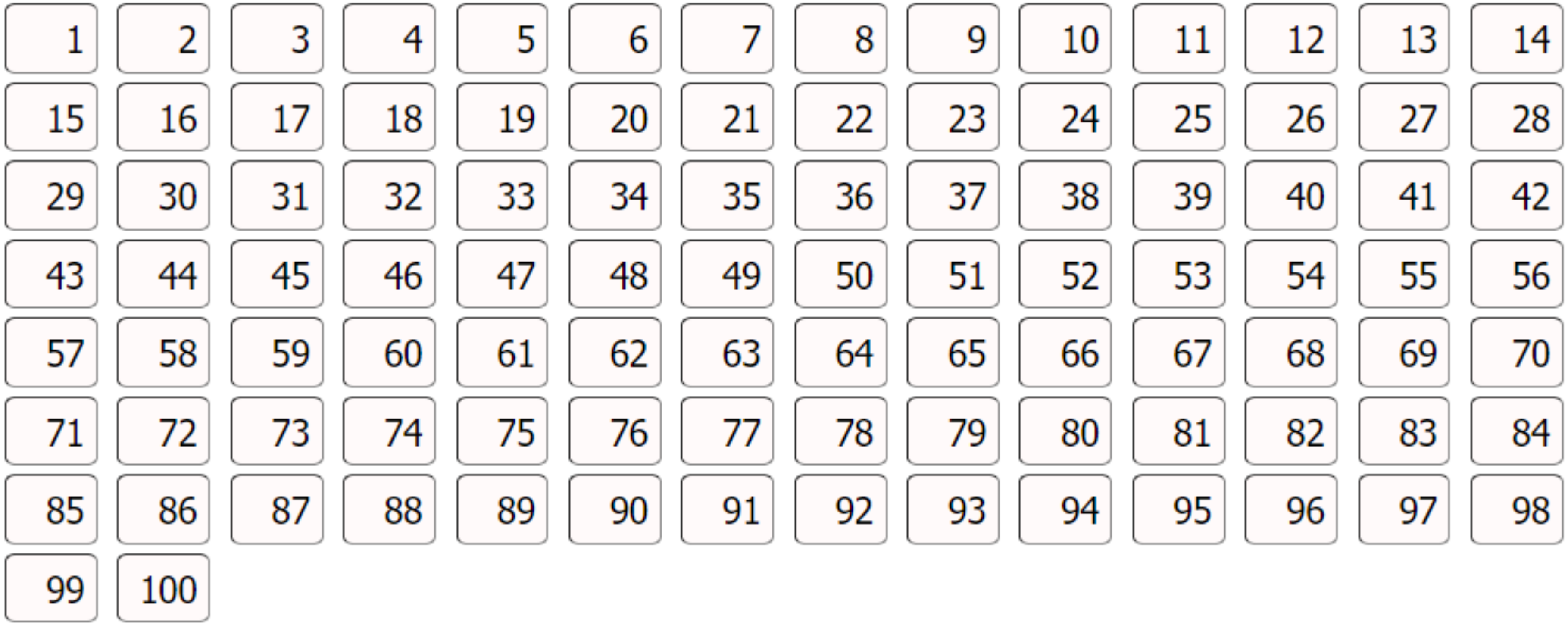
1. Create new Project (Maven) Project
   - Name: **register**
   - Template: Web Application
   - Group: sit.int202
   - Application server: Tomcat 10.0.xxx
   - Version: Jakarta EE 9
2. Add Lombok, JSTL Dependency
3. Test test_css_jstl.jsp with BootStrap, JSTL & EL using code below

```
<div style="padding: 10px;display: block;width: 50%;margin: auto">
    <c:forEach begin="1" end="100" var="value">
        <div class="box">${value}</div>
    </c:forEach>
</div>
```

Output (Expected)



```
  1   2   3   4   5   6   7   8   9  10  11  12  13  14
 15  16  17  18  19  20  21  22  23  24  25  26  27  28
 29  30  31  32  33  34  35  36  37  38  39  40  41  42
 43  44  45  46  47  48  49  50  51  52  53  54  55  56
 57  58  59  60  61  62  63  64  65  66  67  68  69  70
 71  72  73  74  75  76  77  78  79  80  81  82  83  84
 85  86  87  88  89  90  91  92  93  94  95  96  97  98
 99 100
```

Creating Simple Course Registration App (2)

4. Create package sit.int202.register.models
5. Copy all models (4) to package sit.int202.register.models
6. Copy data.txt to resources
7. Create new servlet CourseListServlet then change url-mapping to course-list
8. place code below to doGet() method of CourseListServlet

```
request.setAttribute("semesters",Semester.getAllSemesterText());

getServletContext().getRequestDispatcher("/course_list.jsp").forward(
request,response);
```

Creating Simple Course Registration App (3)

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9. Create view : `course-list.jsp`
10. Modify `course-list.jsp` (download from MS-Teams)
11. Implementing code in method doPost of CourseListServlet

```
Map<String, String[]> parameterMap = request.getParameterMap();
request.setCharacterEncoding("UTF-8");
if (parameterMap.get("semester")==null) {
    doGet(request,response);
    return;
}
int semester = Integer.valueOf(parameterMap.get("semester")[0]);
request.setAttribute("semesters", Semester.getAllSemesterText());
request.setAttribute("selectedSemester", semester);
request.setAttribute("subjects", CourseRepository.getSubjects(semester));
getServletContext().getRequestDispatcher("/course-list.jsp").forward(request,response);
```

Creating Simple Course Registration App (4)

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12. Create new servlet RegisterCourseServlet then change url-mapping to /register
13. Implementing code in method doPost of RegisterCourseServlet (use snipped code from next-slide)
14. Create new servlet CourseRegisterHistoryServlet then change url-mapping to /course-registered-history
15. Create view : `user_registered.jsp`
16. Implementing `user_registered.jsp` for display all registered subject from HttpSession (DIY)

RegisterCourseServlet.java

```
protected void doPost(HttpServletRequest request, HttpServletResponse response) throws
ServletException, IOException {
    Map<String, String[]> parameterMap = request.getParameterMap();
    int semester = Integer.valueOf(parameterMap.get("semester")[0]);

    HttpSession session = request.getSession();
    CourseRegistered courseRegistered = (CourseRegistered) session.getAttribute("courseRegistered");
    if(courseRegistered == null) {
        courseRegistered = new CourseRegistered();
        session.setAttribute("courseRegistered", courseRegistered);
    } else {
        courseRegistered.removeAllRegisteredCourse(semester);
    }

    for(String subjectId : parameterMap.get("registeredSubjects")) {
        courseRegistered.registerSubject(semester, CourseRepository.getSubject(semester,subjectId));
    }
    getServletContext().getRequestDispatcher("/index.jsp").forward(request,response);
}
```