2004

A Wiki paradigm to manage online course content

Elharith Omer Elrufaie

A WIKI PARADIGM TO MANAGE ONLINE COURSE CONTENT

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Computer Science

by

Elharith Omer Elrufaie

June 2004

A WIKI PARADIGM TO MANAGE ONLINE COURSE CONTENT

A Project

Presented to the

Faculty of

California State University,

San Bernardino

by

Elharith Omer Elrufaie

June 2004

Approved by:

[redacted]

Dr. David Turner, Chair, Computer Science — 6/2/2004 Date

[redacted]

Dr. Richard Botting

[redacted]

Dr. Tong Lai Yu

ABSTRACT

The term Wiki means quick in Hawaiian. Wiki, by creator Ward Cunningham's original description, is "the simplest online database that could possibly work!" A wiki allows users to freely create and edit web page content using any regular web browser. Consequently, a wiki page is a web page that can be created and edited in a quick and easy way. In this context, the wiki paradigm can be used to enable a quick, easy and convenient management system of online course content. However, some limitations exist in currently available wiki systems that must first be handled to enable successful online course management. In this project, I have improved a previous work done by a CSUSB alumnus to extend the wiki paradigm for use in classroom. In this new version of the wiki-based course management system, the system works as a generic teaching tool for any information technology department, where there exist many instructors, courses and students. Instructors and students will contribute content using XHTML markup instead of the traditional wiki markup language which adds an excellent learning value to the system.

ACKNOWLEDGMENTS

I would like to dedicate my work to my family, especially to my father and mother, for being such a good example to follow, and for their continuous encouragement and support even when being a part. They have always believed in me and never doubted my potential.

My sincere thanks goes to my advisor, Dr. David Turner, for his continuous help to promote my technical and research skill. I appreciate his enthusiasm for his work and for being such a nice, supportive and helpful advisor. I also would like to thank Vishal Dharod, Buket Tuna and Volkan Uzun for being such good friends in this place. Additionally, I'd like to thank my friends Ibrahim and Ali Mamoun for their useful and valuable advices and guidance through my years in the United States.

Finally, I would like to thank the department of Computer Science at CSUSB for supporting my mission to pursue my M.S degree.

The support of the National Science Foundation (NSF) under award 9810708 is gratefully acknowledged.

Elharith Elrufaie

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

SOFTWARE REQUIREMENT SPECIFICATION

1.1 Introduction

This system will run as a communication interface between students and the instructor. Using this interface, pages are created and modified quickly and easily. An instructor will be able to publish course materials, post announcements, presentations timetable, etc into the web. If the student is enrolled in the course, she will be able to edit these pages and can add, for example, her presentation title to the presentations timetable, or her paper abstract to the term paper page, etc. Moreover, all the pages can be used as a public or private repository, in which students post their homework and limit access of these materials to the instructor.

1.2 Purpose of this Project

The purpose of this project is to develop a new version of the Wiki-Style Administration of Online Course Content. The current version of this system was developed by Jimmy Wang in the fall of 2003 in fulfillment of his Master degree requirements [6]. The main purpose is to implement a teaching and a learning tool that works as an easy and quick communication interface between each instructor and his students. By teaching tool, we mean that both instructor and students can post coursework, and share information and knowledge in the course web page. By learning, we mean that users will be required to use XHTML [8] for input; all input is parsed to determine if it is valid XHTML text, and will not be accepted otherwise. This system extends the traditional wiki by providing authorization functionality, that is, only authorized users (per class) are eligible to make changes in course pages.

The second purpose is to design an easily extendable and maintainable architecture, which provides a generic wiki system that can work for any information technology department, and handles sets of courses and instructors.

1.2 Context of the Problem

The context of the problem is to extend the traditional wiki paradigm and the current running Wiki-Style Administration of Online Course Content by designing and implementing a system that eliminates current limitations and adds learning benefit.

1.3 Project Products

This project would lead to the following products:

- Web Application: A web application that follows the Model View Controller (MVC) architecture, uses PostgreSQL database for storing data, and uses Hibernate as its persistence framework. This web application should achieve the needs of a communication interface between instructor and students. It should also serve as a learning tool, because it requires the use of XHTML as input markup language.
- Users manual: an implementation manual will be available for the user.
- Systems Manual: a project report (this report) will be available with design details and specifications.

1.4 Definition of Terms and Abbreviations

See table 1 for list of terms and abbreviations.

Table 1. Terms and Abbreviations

API	Applications Programming Interface.
CSCI	Computer Science
CSS	Cascading Style Sheets.
CSUSB	California State University, San Bernardino.
GUI	Graphical User Interface.
HIBERNATE	It is object/relational persistence and query service for Java. Hibernate lets you develop persistent objects following common Java idiom - including association, inheritance, polymorphism, composition and the Java collections framework.
HTML	Hypertext Markup Language.
HTTP	Hypertext Transfer Protocol.
IEEE	Institute of Electrical and Electronics Engineers.
Java Servlet	A Servlet can be thought of as an applet that runs on the server side--without a face.
JDBC	Java Database Connectivity.
JSP	Java Server Page.
MVC	Model View Controller.
PostgreSQL	The most advanced open source database system.
RDBS	A relational database stores data in tables (relations). A database is a collection of tables.
SQL	Structured Query Language.
SRS	Software Requirement Specification.
SSL	Secure Socket Layer
Tomcat	Tomcat is the Servlet container that is used in the official Reference Implementation for the Java Servlet and Java Server Pages technologies.
URL	Uniform Resource Locator.
XHTML	eXtensible Hypertext Transfer Protocol.

1.5 Preliminary Design

There are four types of user classes implemented in this project:

1. Registered Student.
2. Instructor.
3. System Administrator.
4. Guest.

A menu page is associated with each type of user. The pages will allow the user to enter, retrieve and/or maintain the data depending on the privileges.

1.5.1 Users Characteristics

Users of the Wiki system would fall into one of the following groups:

1.5.1.1 Student. The user in this group is enrolled in a class at CSCI department, CSUSB. To use the system, the user needs to obtain a login name and password. Once a student adds a class, his class instructor would be the only one to activate his membership to this class. If the instructor accepted him, after comparing his information with the class roster, the student status is automatically changed to active, and afterwards the student can edit and create pages in the course homepage. Otherwise, the student status is set to rejected. In either case, the student is informed by email of any change in his status.

1.5.1.2 Instructor. The user of this group is a faculty in the Department of Computer Science, CSUSB. Registration of instructors is activated upon approval of administrator.

1.5.1.3 Administrator. The user in this group could be a faculty, or a staff, or any system administrator.

1.5.2 Users Functions

The following use case diagram best describes user functionalities.

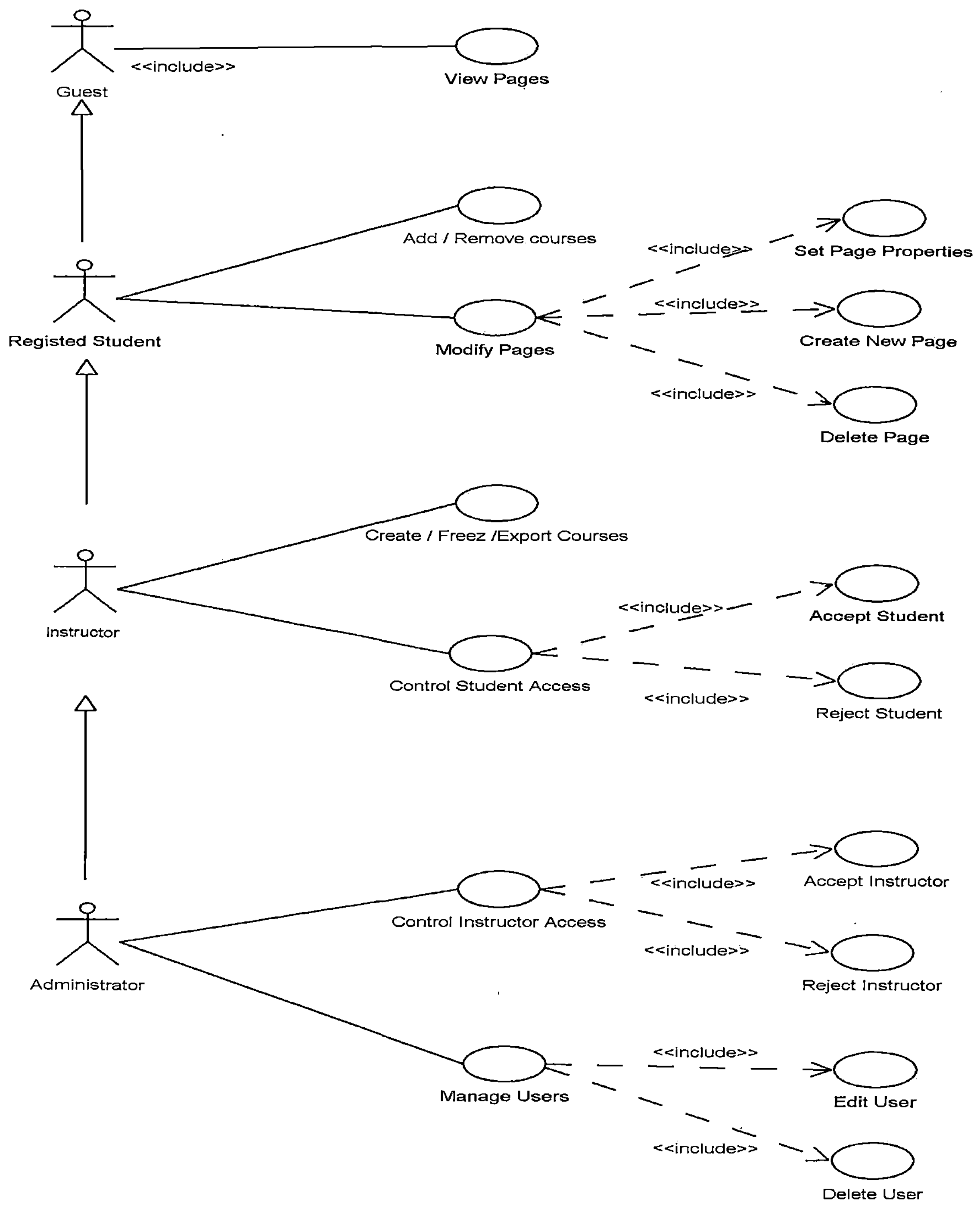


Figure 1. Use Case Diagram

1.5.2.1 Student functions. This menu page provides four options for this class of user:

1. Create pages in the wiki system.
2. Delete pages created by him.
3. Set properties of each page, such as read-only or private.
4. Modify pages in wiki system, unless the page is read-only.
5. Modify personal information.
6. Add and remove courses.

1.5.2.2 Instructor functions. This menu has the same functionality as the student menu page in addition to the following:

1. Start a new class on the system.
2. Change the status of his classes (active or inactive).
3. Approve and reject students on his classes.
4. View his students' information.
5. Contact all his students by email.

1.5.2.3 Administrator functions. This menu page provides the same functionality as instructor menu in addition to:

1. Approve and reject pending instructors.
2. Delete a user.
3. Edit user's information.

1.5.2.4 Guest functions. Guest user will have the ability to view the public pages only, with no authority to edit any page.

CHAPTER TWO

SYSTEM DESIGN

2.1 Architecture

This project follows a 3-tier architecture. The following figure best describes this architecture:

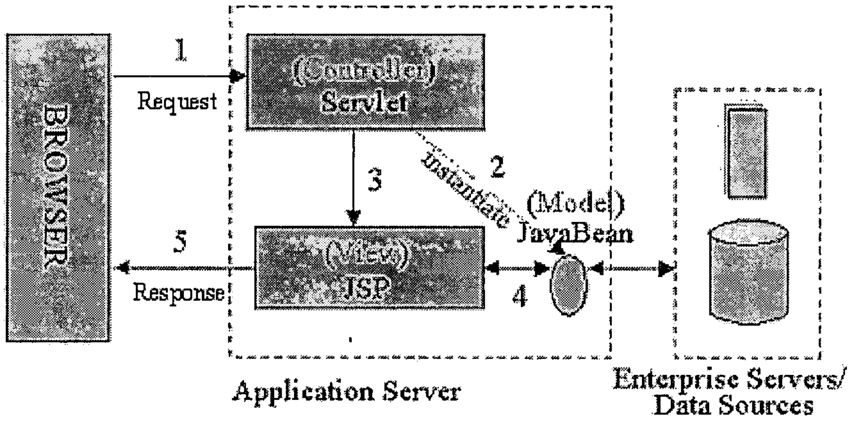


Figure 2. System Architecture

2.1.1 Client Tier

The first tier is the client that represents web browser viewing the system pages.

2.1.2 Middle Tier

The middle is the wiki Server that contains Jakarta Tomcat web server module (with JSP and Servlet API's).

This tier follows the Model View Controller (MVC) architecture. In the MVC design pattern, the application server is segregated into three parts:

1. Model: Stores the data and deals with all the data retrieval issues.
2. View: Displays information and results.
3. Controller: Resolves all business issues, calls appropriate methods in model to forward back to the view.

2.1.3 Database Tier

The third tier is the data source, where Hibernate persistent objects framework maps Java objects to a PostgreSQL relational database management system.

2.2 Database Design

2.2.1 Database Schema Conceptual Model

In designing the schema of this project, three distinct parts have been identified:

1. Courses: collection of courses that are created by faculty or administrator and made available for students to add.
2. Pages: includes all wiki pages information, such as title, contents and page settings.
3. Users: Defines system user and his roles. Every user in the system has a relation to some courses. Meaning that a user can have courses

that she created (if administrator or instructor), or added (if student).

The following Entity Relationship diagram (ER) best describes the system.

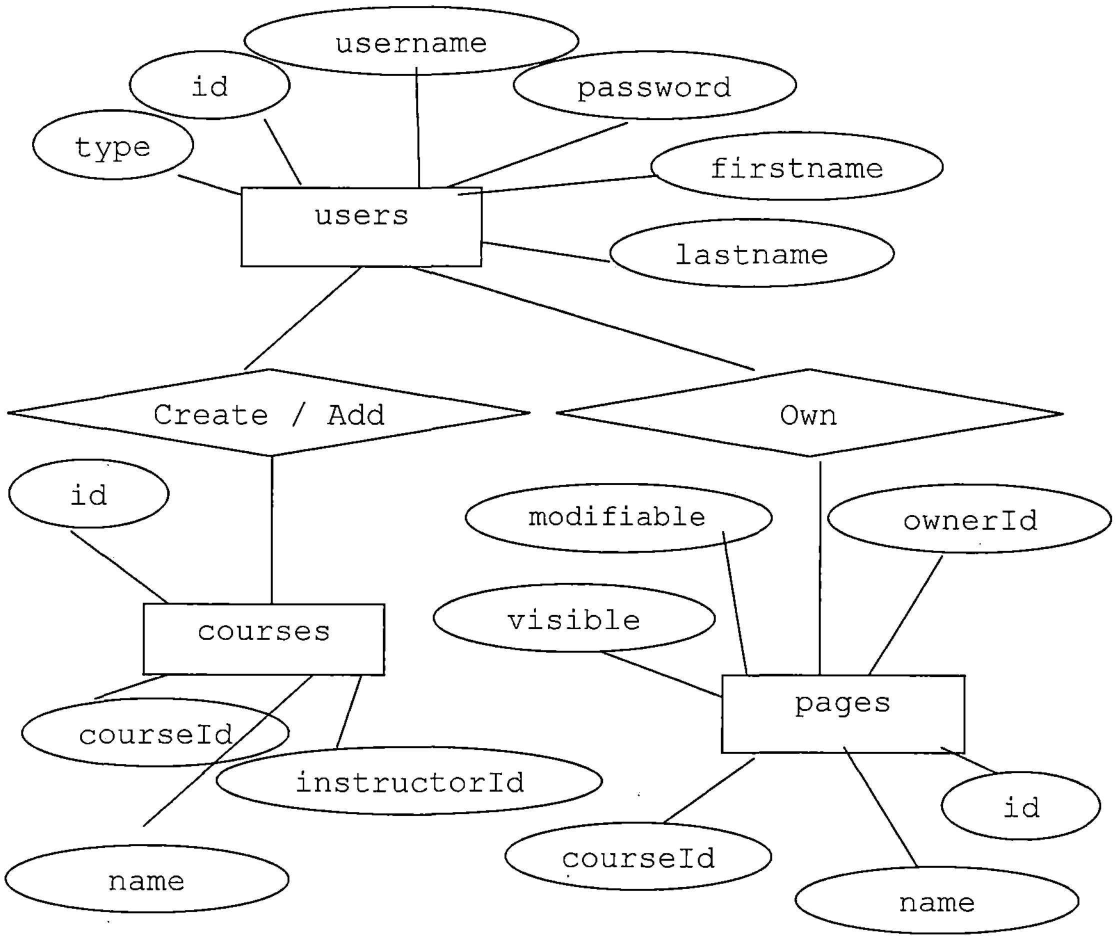


Figure 3. Entity Relationship Diagram

2.2.2 Database Schema Logical Model

The conceptual model ER diagram maps the following relational table design. In the following tables, underlined fields indicate the table primary key.

Table 2. Users Table

Field Name	Data Type	Description
id	INT8	Auto incremented id.
role	VARCHAR(255)	Identifies user's role. 'A' for Administrator, 'I' for Instructor and 'S' for Student.
username	VARCHAR(255)	Unique name for user.
password	VARCHAR(255)	Password for user to login.
firstName	VARCHAR(255)	User's first name.
lastName	VARCHAR(255)	User's last name.
email	VARCHAR(255)	User's email.
status	VARCHAR(255)	Shows status of Instructor in the system. Switched from 'PENDING' to 'ACTIVE' for every activated instructor.
- Id field is auto incremented primary key. - Class should not be null. - username should not be null.		

Table 3. Course Table

Field Name	Data Type	Description
id	INT8	Auto incremented id.
instructor_id	INT8	Stores course creator if was Instructor.
admin_id	INT8	Stores course creator if was Administrator.
title	VARCHAR(255)	Course title.
quarter	VARCHAR(255)	Course Quarter.
year	INT4	Course Year.
status	VARCHAR(255)	Course status, can be 'ACTIVE' or 'INACTIVE'.
- id field is auto incremented primary key. - instructor_id is a foreign key to the id field in Users table. - admin_id is a foreign key to the id field in Users table.		

Table 4. Student Status Table

Field Name	Data Type	Description
student_id	INT8	Stores student id.
Course_id	VARCHAR(255)	Stores course id.
Status	VARCHAR(255)	Represent student's status for each class.
- student_id is a foreign key to the id field in Users table. - course_id is a foreign key to the id field in Course table. - student_id and course_id forms a composite primary key.		

Table 5. Page Table.

Field Name	Data Type	Description
Id	INT8	Stores student id.
Name	VARCHAR(255)	Stores course id.
owner_id	VARCHAR(255)	Represent student's status for each class.
Content	TEXT	Stores page XHTML contents.
Visible	BOOL	Identifies if the page is visible to all users.
modifiable	BOOL	Identifies if the page can be modified by others.
- id is an auto incremented primary key. - owner_id is a foreign key to the id field in the Users table.		

2.3 System Components

To enable successful and flexible interaction between the system tiers, some languages, scripts and tools were used. Below I explain the reasons of using each of these technologies:

- Java was used for its reputation of robustness for web applications use. Java API has a rich set of functions and classes, which allows the flexibility and the ability to build such web applications.

- PostgreSQL was used for data storage medium. PostgreSQL is a real multi-user database and is royalty-free open source software.
- Hibernate is a persistence service that stores Java objects in relational databases. Hibernate is a full-featured, open source mapping framework for the Java platform.

2.4 Software Interfaces

- Internet browser: No browser constraints.
- Operating System (OS): No OS constraints.
- Database: PostgreSQL.
- Web Server: Jakarta Tomcat 5.
- Java API: JDK 1.4.2.

CHAPTER THREE

IMPLEMENTATION

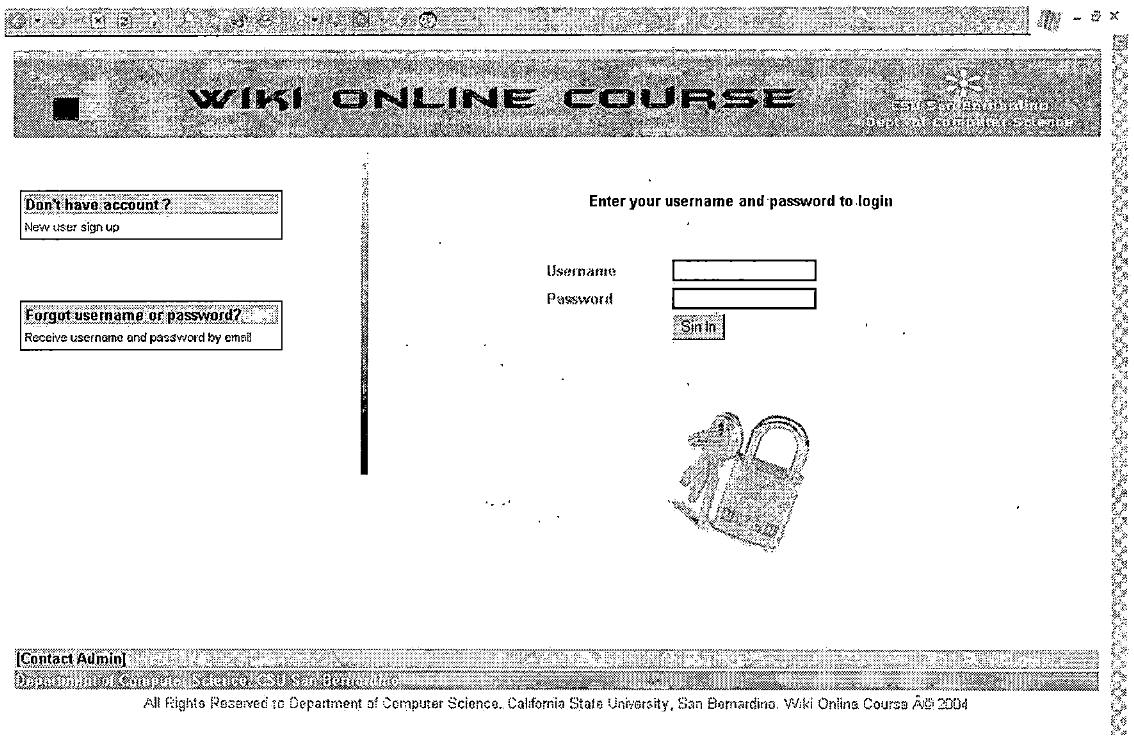
3.1 Introduction

In this chapter, we will discuss the system's basic interface and functionality. One of the main goals of this new version of wiki is to develop a system with a good look and feel. For this purpose, I use Cascading Style Sheets (CSS) to develop the pages; I also use a set of contrasting colors. Every page is divided into two parts: menu options and body. Menu options vary according to the user role. However, the wiki part of the page in the body is the same for all users. The wiki part of the page checks the user input, and reports any invalid XHTML input with a friendly error message. In the following subsections, I describe in more detail the functionality of the system.

3.2 Basic Interface

3.2.1 Authorization and Authentication

This is the main login page (see figure 3). All users, students, instructors and the system administrator will use this page to log in. This page uses server side authentication and authorization using Java Servlets.


WIKI ONLINE COURSE
CSU San Bernardino
Dept. of Computer Science
Don't have account ?
New user sign up
Forgot username or password?
Receive username and password by email
Username
Password
Sin In
[Contact Admin]
Department of Computer Science, CSU San Bernardino

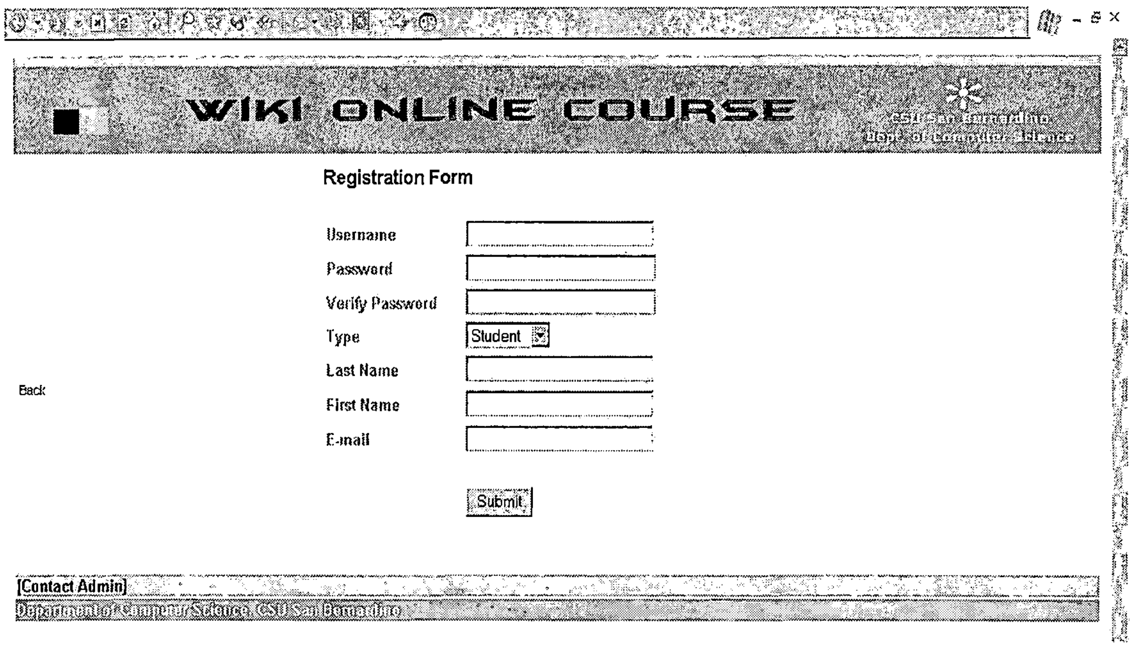
Enter your username and password to login

All Rights Reserved to Department of Computer Science, California State University, San Bernardino. Wiki Online Course Â© 2004

Figure 4. Login Page

3.2.2 New User Registration

New students and instructors use this page to obtain username and password (see figure 4).


WIKI ONLINE COURSE

CSU San Bernardino
Dept. of Computer Science

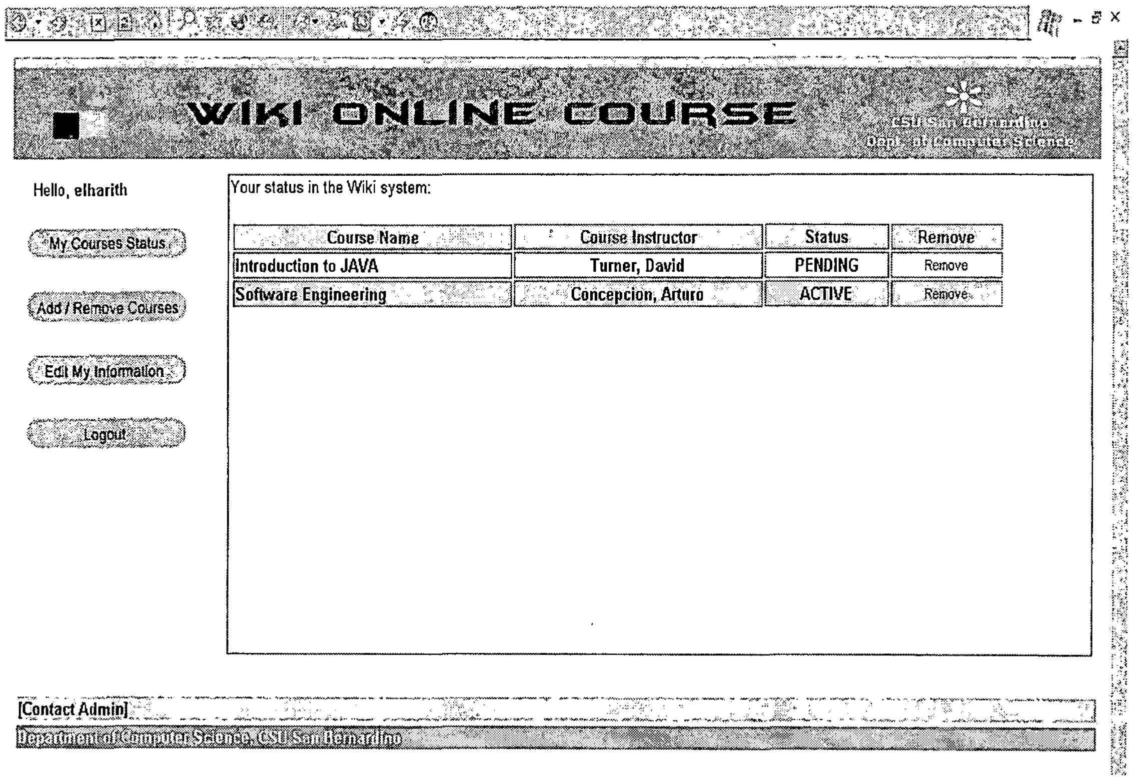
Registration Form

Username	
Password	
Verify Password	
Type	Student
Last Name	
First Name	
E-mail	

Figure 5. New User Registration

3.2.3 Student Main Menu

Student main page shows the student status in the wiki system. It lists the student's status per class. A student status can be active (if an instructor accepted him) so that she can edit the course page. Otherwise, the status is pending (waiting for course instructor authorization).



Hello, elharith

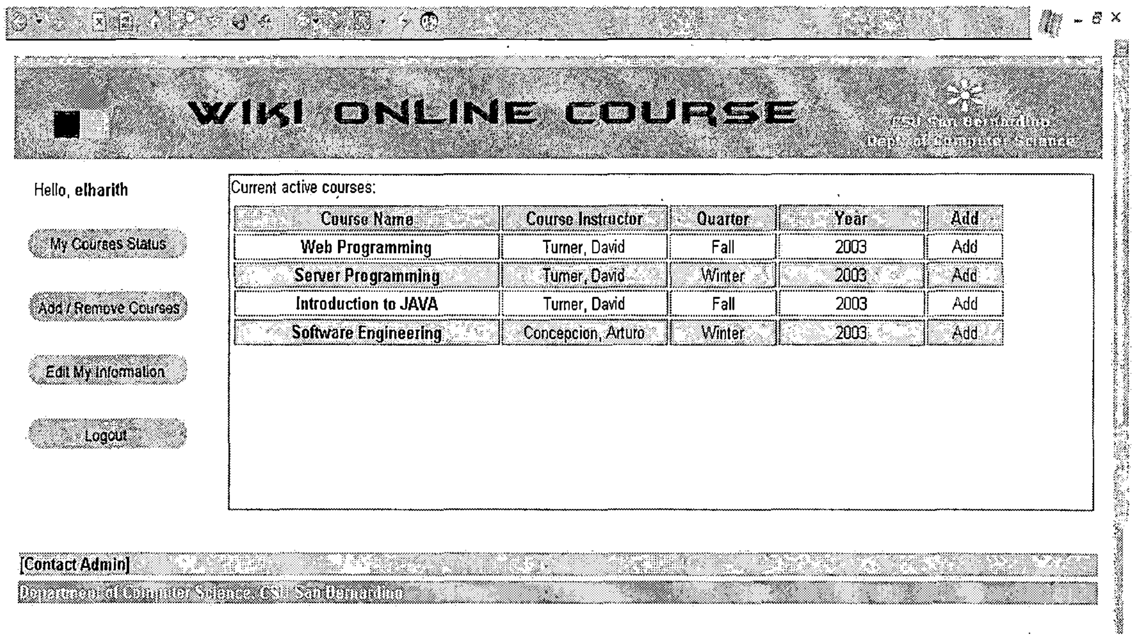
Your status in the Wiki system:

Course Name	Course Instructor	Status	Remove
Introduction to JAVA	Turner, David	PENDING	Remove
Software Engineering	Concepcion, Arturo	ACTIVE	Remove

Figure 6. Student Homepage

3.2.4 Student Add Course Page

The student uses this page to view all active courses in the system and any course to his records. The student is added directly with a pending status by default (see figure 6).



Hello, elharith

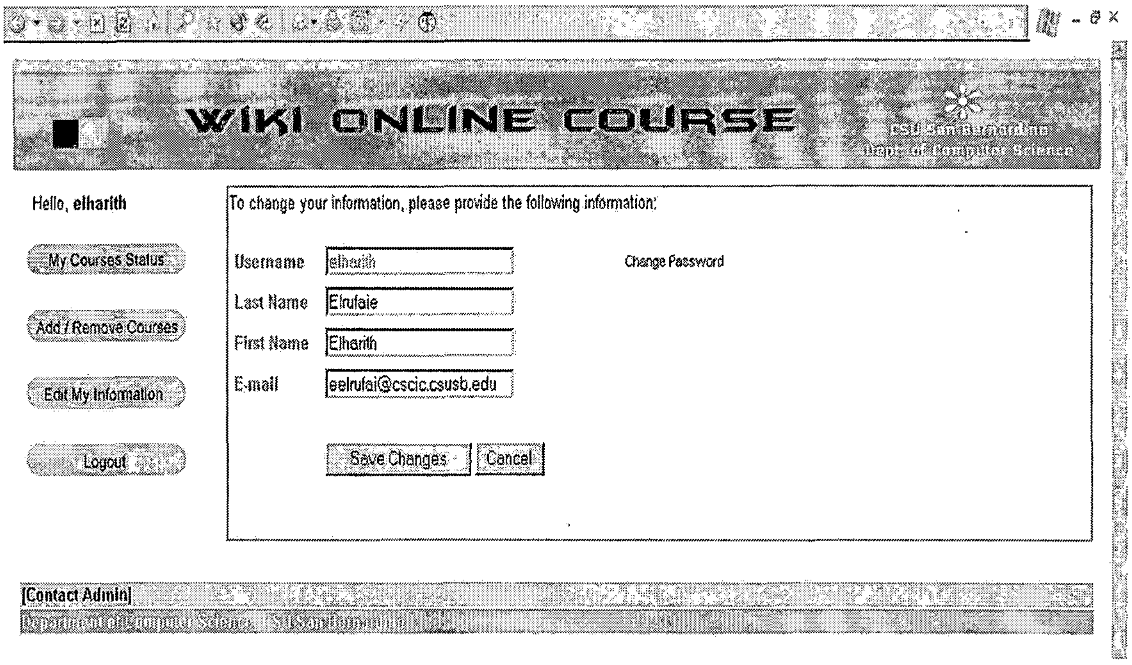
Current active courses:

Course Name	Course Instructor	Quarter	Year	Add
Web Programming	Turner, David	Fall	2003	Add
Server Programming	Turner, David	Winter	2003	Add
Introduction to JAVA	Turner, David	Fall	2003	Add
Software Engineering	Concepcion, Arturo	Winter	2003	Add

Figure 7. Student to Add New Courses

3.2.5 Student Edit Information Page

The student uses this page to view and edit his information, such as first name, last name, email and password (see figure 7).


WIKI ONLINE COURSE

CSU San Bernardino
Dept. of Computer Science

Hello, **elharith**

My Courses Status

Add / Remove Courses

Edit My Information

Logout

To change your information, please provide the following information:

Username	elharith
Last Name	Elrufaie
First Name	Elharith
E-mail	eelrufai@cscic.csusb.edu

Change Password

Save Changes | Cancel

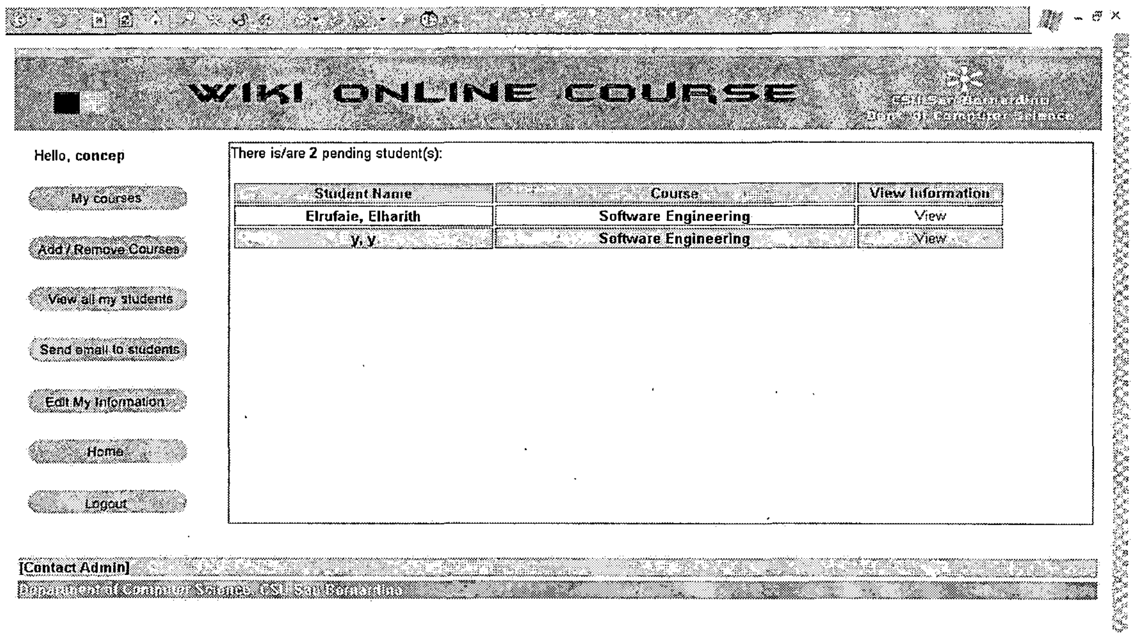
[Contact Admin]

Department of Computer Science, CSU San Bernardino

Figure 8. Student Edit Information Page

3.2.6 Instructor Main Menu

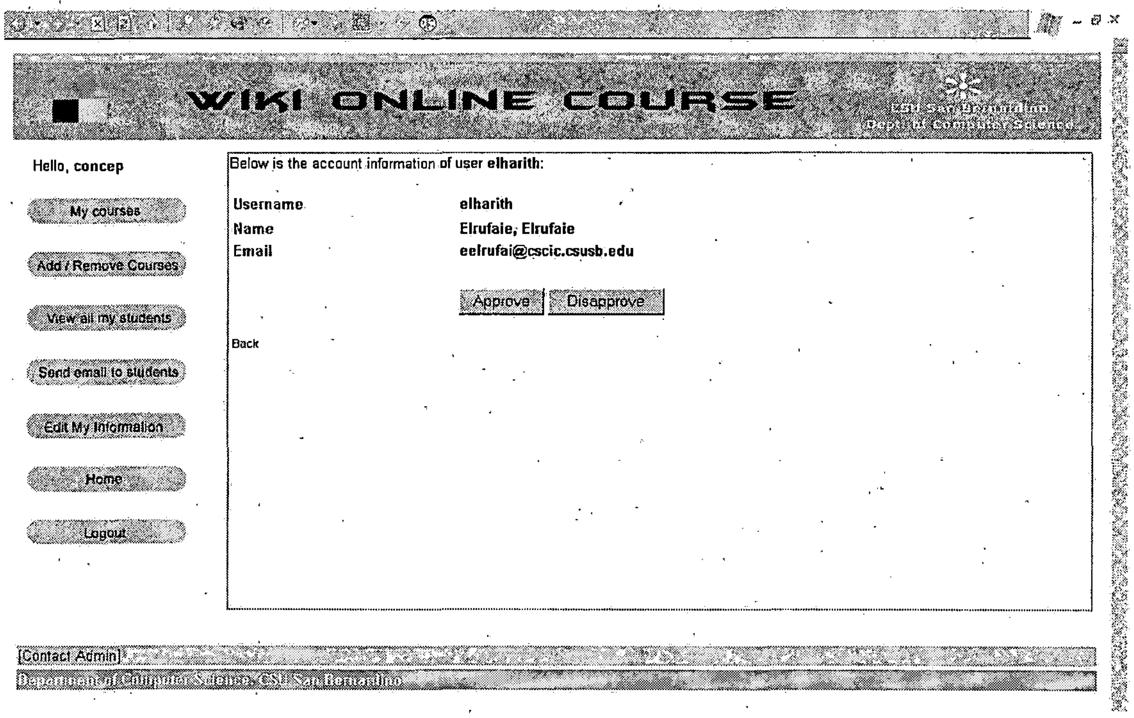
The instructor's main page shows a list of all students who want to enroll in their courses. The instructor is given the option to view their information, such as name and email to ensure they are activating the correct student. Activating a student will change the student status to active, thus she will be able to edit the course page (see figures 8 and 9).



There is/are **2** pending student(s):

Student Name	Course	View Information
Elrufaie, Elharith	Software Engineering	View
y, y	Software Engineering	View

Figure 9. Instructor Main Page



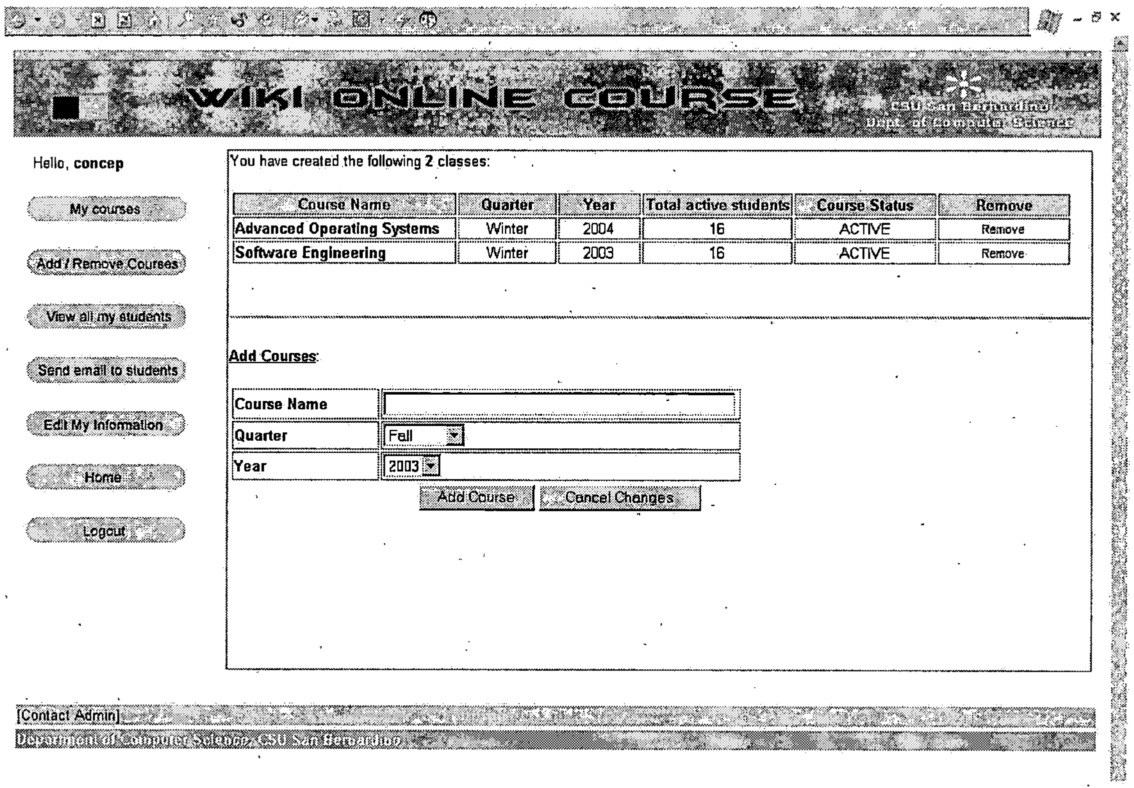
Below is the account information of user **elharith**:

Username	elharith
Name	Elrufaie, Elrufaie
Email	eelrufai@cscic.csusb.edu

Figure 10. View Student Information

3.2.7 Instructor Add Courses

The instructor uses this page to view his current courses in the system and to create new courses as well (see figure 10).



Hello, **concep**

You have created the following **2** classes:

Course Name	Quarter	Year	Total active students	Course Status	Remove
Advanced Operating Systems	Winter	2004	16	ACTIVE	Remove
Software Engineering	Winter	2003	16	ACTIVE	Remove

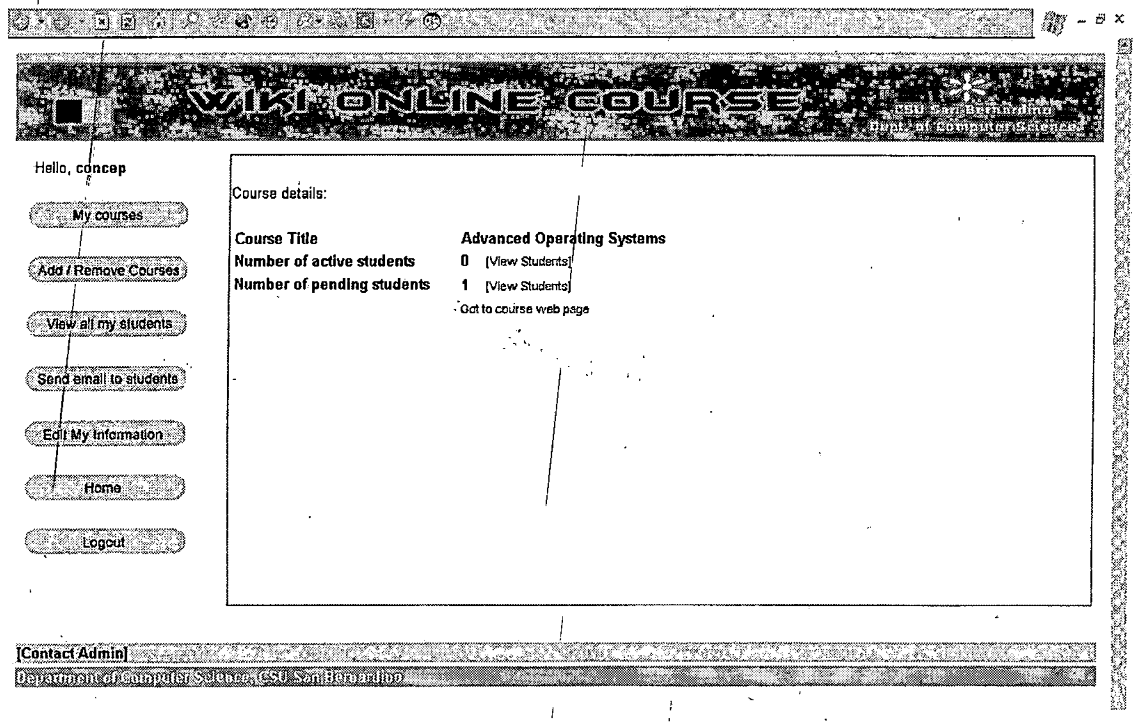
Add Courses:

Course Name	
Quarter	Fall
Year	2003

Figure 11. Instructor to Create New Courses

3.2.8 View Course Details

Instructor uses this page to view students' status per course, and the course web page (see figure 11).



Course details:

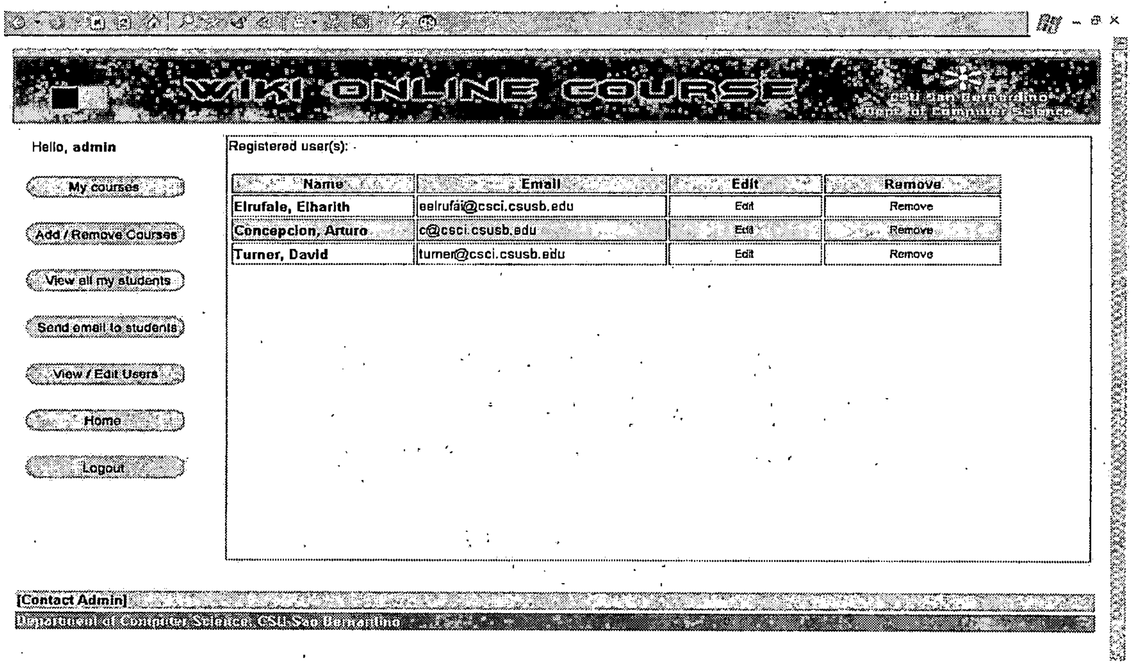
Course Title	Advanced Operating Systems
Number of active students	0 [View Students]
Number of pending students	1 [View Students]

Got to course web page

Figure 12. Course Information

3.2.9 Administrator Main Menu

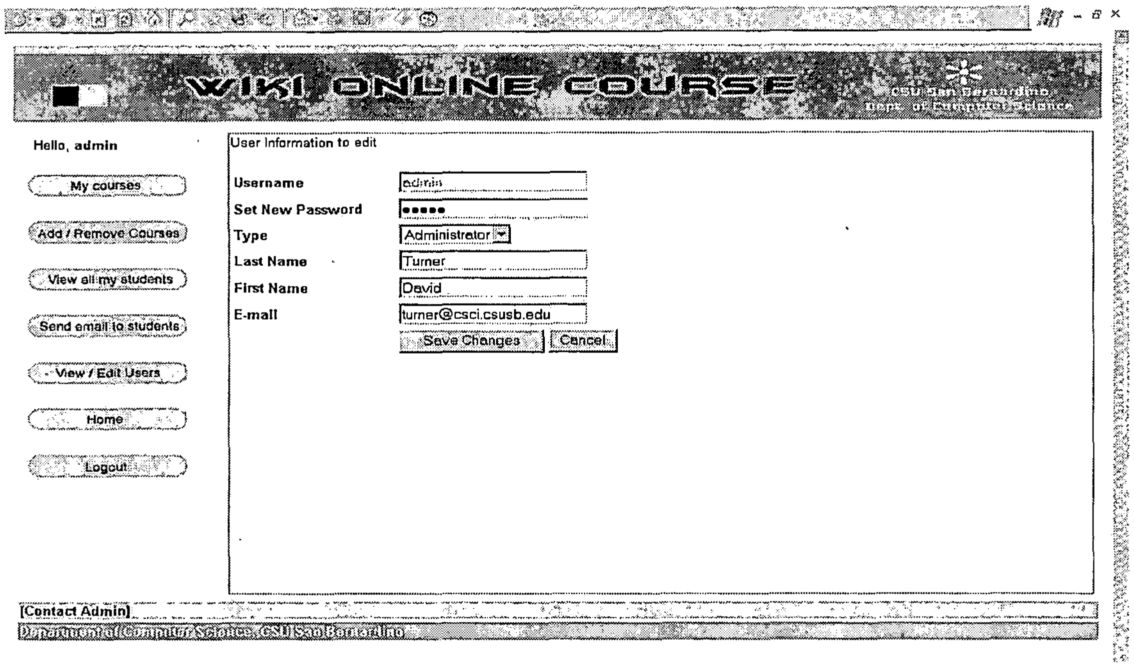
The administrator main page shows a list of all pending instructors and the administrator's pending students. Activating an instructor will allow the instructor to create new courses. Note that the instructor is activated once, unlike a student, who needs activation per course. The administrator is also given the option to view the pending instructors and student information such as name and email (see figure 12).



Registered user(s):

Name	Email	Edit	Remove
Elrufaie, Elharith	eelrufai@csci.csusb.edu	Edit	Remove
Concepcion, Arturo	c@csci.csusb.edu	Edit	Remove
Turner, David	turner@csci.csusb.edu	Edit	Remove

Figure 14. Administrator View Users



User Information to edit

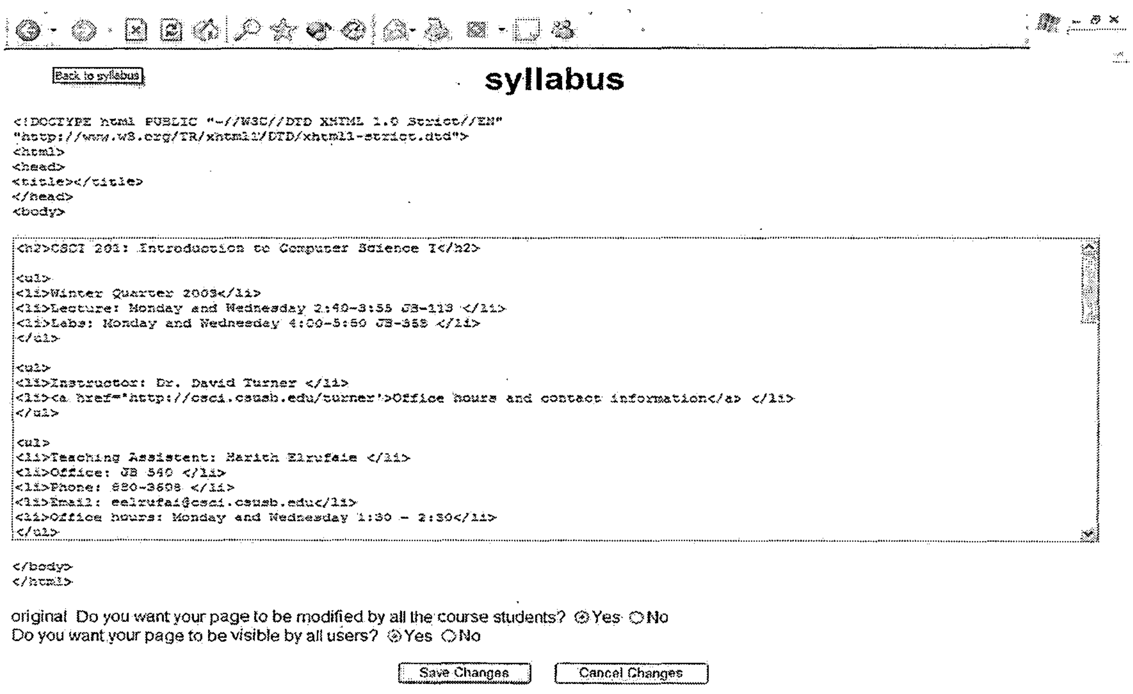
Username	admin
Set New Password	•••••
Type	Administrator
Last Name	Turner
First Name	David
E-mail	turner@csci.csusb.edu

Save Changes | Cancel

Figure 15. Administrator Edit Users

3.2.11 XHTML Edit Page

This is the most important page that the system has. To edit the page, browse to the page you want to edit and double click anyplace in the page body. The whole text of the page should be transformed into a large text area box to allow changing page contents. Input language in this version is XHTML, unlike the wiki markup language used in this first version of this project. If the user who is editing the page is the owner of the page, there will be two more check boxes shown at the bottom of the text field named "modifiable by users" and "visible by others." These are the page attributes that can be set by the owner of the page to grant or deny to other users the ability to view or modify the page (figure 15).

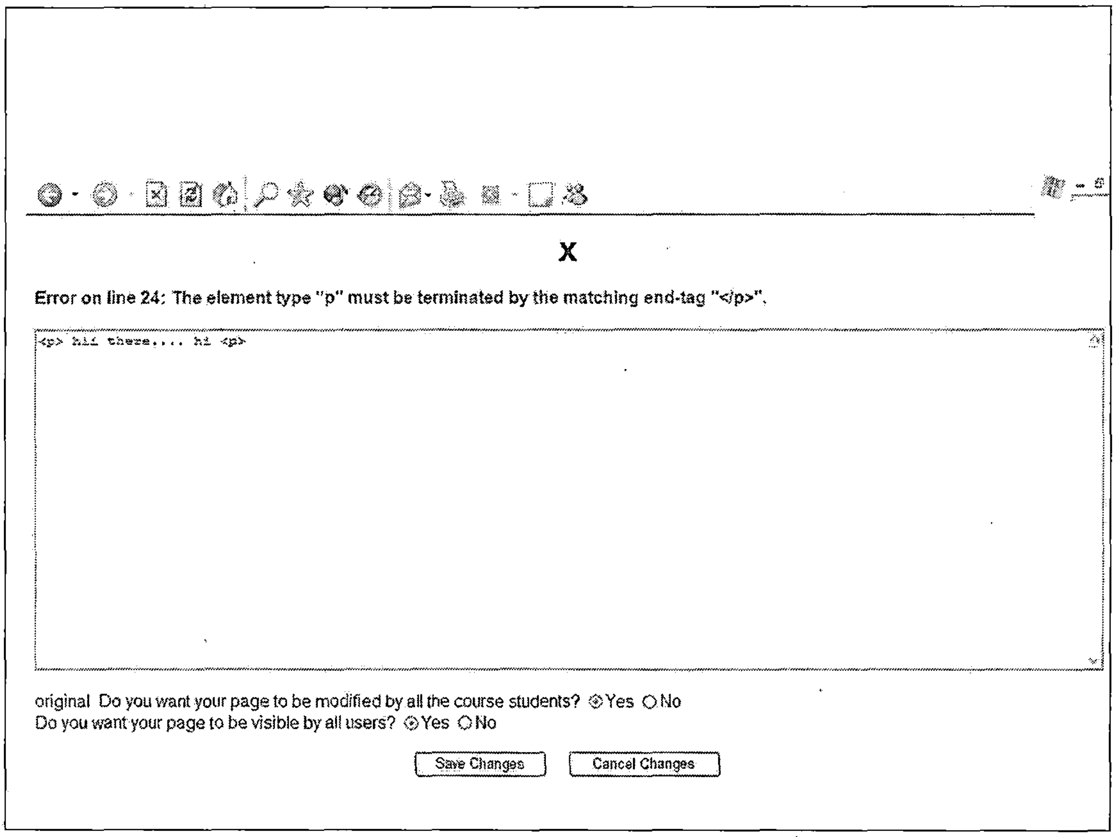


syllabus

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
<head>
<title></title>
</head>
<body>

<h2>CSCI 201: Introduction to Computer Science I</h2>

<ul>
<li>Winter Quarter 2003</li>
<li>Lecture: Monday and Wednesday 2:40-3:55 JB-113 </li>
<li>Labs: Monday and Wednesday 4:00-5:50 JB-358 </li>
</ul>

<ul>
<li>Instructor: Dr. David Turner </li>
<li><a href="http://csci.csusb.edu/turner">Office hours and contact information</a> </li>
</ul>

<ul>
<li>Teaching Assistent: Harith Elrufaie </li>
<li>Office: JB 340 </li>
<li>Phone: 880-3608 </li>
<li>Email: eelrufai@csci.csusb.edu</li>
<li>Office hours: Monday and Wednesday 1:30 - 2:30</li>
</ul>

</body>
</html>
```

original Do you want your page to be modified by all the course students? [✓ Yes] No
Do you want your page to be visible by all users? [✓ Yes] No

Figure 15. XHTML Edit Page


X

Error on line 24: The element type "p" must be terminated by the matching end-tag "</p>".

```
<p> hii there.... hi <p>
```

original Do you want your page to be modified by all the course students? [✓ Yes] No
Do you want your page to be visible by all users? [✓ Yes] No

Figure 16. XHTML Error Page

CHAPTER FOUR

VERIFICATION AND VALIDATION

The system validation test is a kind of test process which can ensure that our program meets the expectation of the user. The purpose of the system validation is to provide a high degree of assurance that a specific process will consistently produce a result which meets predetermined specifications and quality attributes. This can also guarantee the system performance and reliability.

4.1 Unit Test

Unit test is the basic level of testing where individual components are tested to ensure that they operate correctly. These individual components can be object, class, program, etc.

Table 6. Unit Test Results (Forms)

Forms	Tests Performed	Results
Add User Page	• Verify handling valid data input. • Check all the buttons work properly.	Pass
Frame allocate page	• Verify the frame allocation is properly.	Pass
Edit Page	• Verify the timer work properly. • Check the insert function work properly. • Check all the button work properly.	Pass
Login Page	• Check all the button work properly. • Verify the page can get the error message and work properly by the message. • Verify the user save in session after login	Pass
Logout Page	• Check all the button work properly. • Verify the user remove from session after logout. • Check the page redirect to proper page after logout.	Pass
Update My Account Page	• Check all the buttons work properly. • Verify the page get the correct user account information. • Verify handling valid data input. • Verify the data updated correctly.	Pass

Table 7. Unit Test Results (Class: User)

Forms	Tests Performed	Results
get_no	• Make sure the returned number is correct.	Pass
Getid	• Make sure the returned id is correct.	Pass
Getname	• Make sure the returned name is the correct user's name.	Pass
Getpassword	• Make sure the returned password is the user's password.	Pass
Getemail	• Make sure the email address returned is the correct user's e-mail address.	Pass

Table 8. Unit Test Results

4.2 Subsystem Testing

Subsystem testing is the next step up in the testing process where all related units from a subsystem do a certain task. Thus, the subsystem test process is useful for detecting interface errors and specific functions. Table 24 show subsystem test results in detail.

Table 9. Subsystem Test Results

Subsystem	Tests Performed	Results
Authorize subsystem	• Test if it can get the error message. • Make sure the result of authorizing user is correct. • Verify the login user information is store in session properly. • Check if the saving user login information function stores the user information in cookies for future login use. • Check if the login page can get the saved user login information saved before from cookies. • Verify the login page redirect to the correct browsing or editing page after the user logins in.	Pass
Accounts management subsystem	• Make sure all the existing users are list in the user list. • Check if the subsystem can detect the error of creating of the user that exists in the subsystem. • Check if the user can update his/her own account properly. • Verify the created user information is the same as the information provided. • Verify the subsystem can delete a user account	Pass

Subsystem	Tests Performed	Results
	properly. • Make sure the password query function can work properly.	
Browsing subsystem	• Check if the subsystem checks for user privilege before showing pages. • Verify the page is showing properly after the user click on the page link.	Pass
Editing subsystem	• Make sure the subsystem checks the user privilege before forwarding to edit page. • Verify the subsystem check the user privilege before update the page information. • Verify if the subsystem shows the page properties is the users are the owner or the administrator.	Pass
Orphan pages subsystem	• Make sure all the orphan pages are shown on the list. • Verify the owner the page or the administrator can delete the specific orphan page.	Pass

4.3 System Testing

System testing is the testing process that uses real data, which the system is intended to manipulate, to test the system. First all subsystem will be integrated into one system. Then test the system by using a variety of data to see the overall result.

System testing of begins with the following steps:

Table 10. System Test Results

System Testing		Results
1.	Install the system into server.	Pass
2.	Start up all servers including Tomcat server and PostgreSQL database server.	Pass
3.	Running testing by using real data on all forms and reports.	Pass

CHAPTER FIVE

MAINTENANCE MANUAL

The maintenance manual records any information that can be used to setup the system or backup the system. In order to make sure the system works smoothly and meets the expectation of the users, it is very important to follow the maintenance manual step by step carefully.

5.1 Software Installation

The system requires Linux RedHat as an operating system, PostgreSQL, JSDK, Ant, TOMCAT, and JDBC to run the programs. Following will detail the installation of those 6 softwares.

5.1.1 RedHat Installation

RedHat is a linux base operating system which is offered freely and be downloaded from internet. The reason we choose RedHat is it offers better performance than a Microsoft operating system. Following are the steps to install RedHat onto your machine.

1. Download a latest version of the RedHat operating systems from http://ftp.redhat.com/pub/redhat/linux/9/en/iso/i386/ and burn the files into CDs.

2. Install the operating system by inserting CD 1 into the CD-ROM and start up the machine which is going to install the operating system.
3. The machine will startup via CD-ROM and start to install RedHat.
4. Follow the install wizard and sets up the required information such as network setting and the hardware environment.
5. After all the necessary files are copied into the computer and install it, the machine will restart and Redhat is installed.

5.1.2 PostgreSQL Installation

PostgreSQL is the database system we use in this project; it's free, and is included in RedHat by default. To install PostgreSQL, follow the following steps:

1. Because PostgreSQL may install on to RedHat when the operating system is installed, the first thing we have to do is to check if the PostgreSQL is already in the operating system. Using the command to check if PostgreSQL exist in the operating system:

   ```
   rpm -q postgresql
   ```

If PostgreSQL is not installd in the operating system, then use rpm to install it.

2. In order to create a database user, "wiki," and database, have the following commands executed.

```
su postgres
initdb -D /var/bin/pgsql/data
createuser wiki
createdb wiki
```

where at the first command, the postgres is the default user for PostgresSQL. Starting the database by using the command "initdb" with the directory "/var/bin/pgsql/data/" which is the default database directory will start up the database system. Login postgres as the supervisor and create a database user, "wiki," and the database "wiki."

3. There are still some steps needed to setup the environment values.

In the user's environment setup file /etc/profile.d/*.sh, add the following line:

```
export PGDATA=/var/lib/pgsql/data
```

Open the file /var/lib/pgsql/data/postgresql.conf and uncomment the line:

```
tcpip_socket = true
```

In order to have the database system starup at the system start, have the command executed:

```
/sbin/chkconfig --level 3 postgresql on
```

And, the last step is to startup the database system immediately now without restart the system:

```
/sbin/service postgresql start
```

After having the steps above executed, the database system is ready to go and now we have to install JAVA platform, JAVA 2 Platform, Standard Edition (J2SE).

5.1.3 JAVA 2 Platform, Standard Edition (J2SE)

J2SE is the compiler program for JSP and JAVA Servlet programs and it's required in TOMCAT JAVA Container. Fist of all, we go to http://java.sun.com/j2se/1.4.1/download.html to download SDK Linux (all languages, including English) to the directory /usr/java, then execute the following commands:

```
chmod +x j2sdk-1_4_2_01-linux-i586-rpm.bin
./j2sdk-1_4_2_01-linux-i586-rpm.bin
```

```
rpm -ivh j2sdk-1_4_2_01-linux-i586.rpm
```

And, set the environment variables in the file /etc/profile.d/*.sh:

```
JAVA_HOME=/usr/java/j2sdk1.4.2_01
PATH=${PATH}:${JAVA_HOME}/bin
Export JAVA_HOME
```

5.1.4 Tomcat

TOMCAT is one of the apache jakarta projects, which is a web container to process JSP and JAVA Servlet programs, and to serve static web pages. First of all, we go to the tomcat's official download ftp server at http://ftp.epix.net/apache/jakarta/tomcat-5/v5.0.12-beta/bin/ to download the file of tomcat server for linux jakarta-tomcat-5.0.12.tar.gz to /usr/java/ and extract it to the hard drive.

```
tar -xzvf jarkata-tomcat-5.0.12.tar.gz
```

Also, we modify the file /usr/java/jarkata-tomcat-5.0.12/conf/server.xml by add the following setting in the file:

```
<Context
   path="/wiki"
   docBase="/pub/wiki"
   debug="0"
   swallowOutput="true" >
<Logger
   className="org.apache.catalina.logger.FileLogger"
   prefix=""
   suffix=".log"
   directory="/pub/wiki/logs"
   timestamp="true" />
      <Parameter name="contextPath"
                                   value="/wiki" />
      <Parameter name="homePage" value="HomePage" />
      <Resource name="jdbc/postgres"
auth="Container"
                           type="javax.sql.DataSource" />
      <ResourceParams name="jdbc/postgres">
         <parameter>
            <name>factory</name>
     <value>org.apache.commons.dbcp.BasicDataSourceF
          actory</value>
         </parameter>
         <parameter>
            <name>driverClassName</name>
            <value>org.postgresql.Driver</value>
         </parameter>
```

```
    <parameter>
       <name>url</name>
<value>jdbc:postgresql://127.0.0.1:5432/wiki</v
     alue>
    </parameter>
    <parameter>
       <name>username</name>
       <value>Jimmy</value>
    </parameter>
    <parameter>
       <name>password</name>
       <value></value>
    </parameter>
    <parameter>
       <name>maxActive</name>
       <value>10</value>
    </parameter>
    <parameter>
       <name>maxIdle</name>
       <value>2</value>
    </parameter>
    <parameter>
       <name>maxWait</name>
```

```
                    <value>-1</value>
                </parameter>
            </ResourceParams>
    </Context>
```

And, set the environment variable by adding the following lines in the file /etc/profile.d/*.sh

```
CATALINA_HOME=/usr/java/jarkata-tomcat-4.1.27
    PATH=${PATH}:${JAVA_HOME}/bin:${CATALINA_HOME}/bin
    export CATALINA_HOME
```

Add the following lines in the file /etc/rc.local to have the tomcat run when the system boots:

```
    Export JAVA_HOME=/usr/java/j2sdk1.4.2_01
    export CATALINA_HOME=/usr/java/jarkata-tomcat-4.1.27
    ${CATALINA_HOME}/bin/startup.sh
```

5.1.5 JAVA Database Connectivity (JDBC)

The API used to execute SQL statement is different for each database engine. Java programmers, however, are lucky and are freed from such database portability issues. They have a single API, the Java Database Connectivity API (JDBC), that's portable between database engines. The JDBC library provides an interface for executing SQL statements. It provides the basic functionality for data access. A number of drivers are available for PostgreSQL, and information about this can be obtained at the PostgreSQL homepage at http://jdbc.postgresql.org/download/. Download pg73jdbc3.jar and copy the file to /usr/java/jakarta-tomcat-4.1.18/common/lib/.

5.2 Variables Modification

We have to change some environment variables in the linux system and server.xml in Tomcat server configuration directory.

5.2.1 System Variables

1. Open the file "server.xml" in the directory "/usr/java/jakarta-tomcat-4.1.18/conf" via "vi" or any other editor.
2. Scroll down until you see the context area we added in at chapter 7.4.1.
3. The variable "path" in Context indicates the context path of the web application. The default value would be "/wiki."
4. The variable "docBase" in Context is the files directory for the web application. The default value would be "/pub/wiki."

5. The variable "variable" in Logger is the absolute or relative pathname of a directory in which log files created by this logger will be placed. The default value would be "/pub/wiki/logs."

6. Now, lets look down at the parameter setting.

7. The parameter "contextPath" indicate the context path for the system which would be the same as the value of path.

8. The parameter "homepage" sets the name of the home page of wiki system. The default value would be "HomePage."

9. The parameter "username" is the user name who can access the database system. Usually, this value would be the administrator.

10. The parameter "password" is the password corresponding to the user name at 9. If there is no special setting in database system, leave the value to be empty.

5.3 Installation/Migration

1. All the JSP programs and HTML programs are stored in
   \pub\wiki
2. All the classes are stored in
   \pub\wiki\WEB-INF\classes
3. Place the web.xml for in
   \pub\wiki

5.4 Backup and Restore

Backup is a very important action needed for any system to prevent losing data. No one can say a system works very well and will never have a problem. There are two steps to back up WOACC. One is to backup the system files. The other step is to backup the database which is used by the system.

5.4.1 System Backup

All the files are located in the directory "/pub/wiki" and all its subdirectory. Thus, in order to backup the system files, all we need to do is to backup the files in the directory. The method here I suggest is to compress the directory of "/pub/wiki" including its subdirectory to compress files for future use by the compress program "tar." Using the following command to backup the system files:

```
tar -cf wiki.tar /pub/wiki
```

5.4.2 Database Backup

To backup the database system, we use pg_dump command. The following command is used to backup the database:

```
pg_dump wiki | gzip wiki.zip
```

After executing the backup command above, the file Wiki.zip would be the backup file of the database.

5.4.3 System Restore

To restore the system file, simply extract the backup file by using the following command:

```
tar -xzvf wiki.tar /
```

By the command above, all the files will restore into the directory /pub/wiki and complete the restore system process.

5.4.4 Database Restore

To restore the database needed for the system, go to the directory where your database backup file is in, and execute the following commands:

```
createdb wiki
gunzip -c wiki.zip | psql wiki
```

After the commands are executed, the database is restored to the database system. Then, restart tomcat, the wiki will be completely restored.

CHAPTER SIX

CONCLUSION AND FUTURE DIRECTIONS

6.1 Conclusion

This project shows a successful implementation of extending the wiki paradigm to serve a whole department of instructors involved in teaching information technology. The system has been designed and implemented with highly effective contemporary tools and technologies, which makes it flexible for more enhancements and improvements. The system is capable of handling sets of courses offered by set of instructors, where students can be enrolled in more than one class. Moreover, the wiki part works with XHTML validation, which provides an excellent learning environment for students.

This system will run as a communication interface between students and instructors. Using this interface, pages are created and modified quickly and easily. An instructor will be able to publish course materials, post announcements, presentations timetable, etc into the web. If the student is enrolled to the course, she will be able to edit these pages and can add for example her presentation title to the presentations timetable, or her paper abstract to the term paper page. Moreover, all the pages can be used as a public or private repository, so that students can post her homework and then limit access to instructor.

This project consists of various state-of-the-art java web technologies. The project has provided me with the experience in server side programming and persistent object frameworks, designing extensible web applications, and debugging real world applications.

REFERENCES

1. Martin Fowler with Kendall Scott. UML Distilled - A brief guide to the standard object modeling language. Addison Wesley Longman, July 2001.

2. Elmasri and navathe. Fundamentals of Database Systems, third edition. Addison Wesley, June 2000.

3. PostgreSQL Reference Manual for version 7.3. <http://www.postgresql.org/docs/>.

4. Dr Turner homepage. <http://www.drturnet.net>.

5. Hibernate Reference Manual. http://www.hibernate.org

6. Chien-Min Wang. Wiki-Style Administration of Online Course Content, 2003.

7. Chien-min Wang and David Turner. Extending the Wiki Paradigm for Use in the Classroom, International Conference on Information Technology (ITCC 2004), Las Vegas, NV, Apr 2004.

8. XHTML. The Extensible HyperText Markup Language. <http://www.w3.org/TR/xhtml1/>.