THE FLORIDA STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCE

GRADUATE TUITION WAIVER SYSTEM

By

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The members of the committee approve the project of Rajkeerat Singh Sethi defended on April 13, 2004.

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ABSTRACT

Every department of every university undergoes the tedious process of tuition waivers for eligible graduate students. The entire process is mainly paper-based, resulting in overuse of time, money and other resources. The process is also prone to errors, intentional and unintentional. The Graduate Tuition Waiver System is an attempt to automate the tuition waiver process, which will drastically decrease the administrative workload. The new Graduate Tuition Waiver System will be an efficient and quick Tuition Funds Management Tool enabling the coordinator to get a quick and accurate estimate of the amount of money spent on tuition waivers at any given point of time.

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CHAPTER 1

Introduction

1.1 What Is A Tuition Waiver?

A Tuition Waiver is a scholarship that covers the tuition costs of a graduate student. At Florida State University, all graduate assistants who have at least a one-quarter-time assistantship (teaching or research) or students on a fellowship are eligible for a tuition waiver. Tuition Waivers are comprised of two components – In-state or Matriculation Component, and Out-of-State Component. The In-state or Matriculation Component is a mandatory component for all qualifying graduate assistants. Out-of-state waivers are for teaching assistants and research assistants on contracts and grants. The waiver covers only the matriculation and out of state portion, 92% of the assessed fees. It must be noted that the student must pay additional charges such as health fee, financial aid fee, building fee etc. Tuition Waivers may be used to cover courses related to the student's academic program.

1.2 Existing Process

The current process is a paper – based process, which is prone to errors at every stage. Eligible graduate students fill in a waiver request each semester, indicating their schedule of classes and other related personal information. The coordinator of tuition waivers then needs to check for accuracy of the student's name, social security number, occupation code and academic status. The coordinator verifies the correctness of each student's schedule of classes, the course number, the course descriptions and the number of credit hours registered for each of the courses. The coordinator also checks if the student has requested for more than 12 hours of waiver.

The coordinator of tuition waivers keeps track of how much money has been spent on a student for a given term and year. The coordinator also needs to keep record of the total money spent on tuition waivers per term. Any changes made to the student's schedule of classes during the Drop-Add Period need to be reflected on their waiver schedule. This is a required step, as waivers should be processed for classes the student is actually registered for.

1.3 Motivation

The current paper-based system not only uses a lot of time, money and other resources, but also is prone to human errors at every stage. This is very clearly seen in the current scenario.

Students make several mistakes while filling out the waiver request form. In most cases, the students enter incorrect occupation codes and academic status. Some students enter the wrong social security number too. In many cases, the students enter incorrect course numbers and descriptions or even request waivers for courses they are not even registered for, or courses that are not permitted by the department. The coordinator of tuition waivers needs to check for these errors before going ahead and processing the tuition waiver for a student.

The coordinator should have the ability to restrict the waiver request process to authorized students only. This would minimize the number of invalid waiver requests. He / She also needs to keep track of the money being spent on tuition waivers every semester and should be able to pull up a quick estimate of the money spent at any given point of time.

All of the above reasons along with the overheads of resource, time and money management strongly motivated the concept and development of an automated system. The proposed Graduate Tuition Waiver System is an automated, Web-enabled system to process and request tuition waivers. This online system has been designed to greatly decrease the administrative workload associated with graduate students' tuition waivers.

Automation was possible because the entire tuition waiver process was well laid out. There were clear-cut algorithms defined for each step in the process. Each step in the process could be implemented as an atomic process in the new automated, web-enabled system. Also, web enabling the entire process reduces the amount of paper used and also gives the students the ability to remotely create, update or view their waiver schedules.

Chapter 2 deals with the various assumptions made and the environmental constraints during the development of the new system. Chapter 3 gives an idea as to what a tuition waiver is, the current process and why I decided to deviate from the current process. Chapter 4 analyzes the problems and shortcomings of the current paper-based system.

Chapter 5 summarizes the requirements for the new system. The specifications, design and implementation of the new system are discussed in Chapter 6 and 7. Chapter 7 also discusses the database schemas and architecture of the new Graduate Tuition Waiver System. Chapter 8 concludes the document and also discusses some of the future enhancements of the proposed system. The code, system requirements and user manual for the development system can be found in Appendices A, B and C respectively.

CHAPTER 2

Assumptions and Constraints

Some basic and elementary assumptions were made during the development of the Graduate Tuition Waiver System. I assumed that the user is able to see and hear properly. The user should be able to use the keyboard and mouse to use this application effectively. An adequate understanding of the English language is assumed and the user should be able to follow simple instructions. The user is expected to have some basic knowledge of computers and Internet technologies. Also, the user should have access to a computer and an Internet connection.

The students who are eligible for a tuition waiver should have a fair idea of what a tuition waiver is and clearly understand the policies and rules associated with it. The idea behind the development of the automated system was to centralize the administration and reduce the associated workload. The authorized students should be aware of limits in accessing and updating their own personal information and waiver schedules. The administrator of the Graduate Tuition Waiver System should be aware of his / her limits while creating, deleting or printing waiver schedules, updating a student's personal information and printing waiver summaries for the department and college.

The above-described constraints for the students and administrators were designed into the application as measures of security and protection. The students are limited to creating, updating and viewing their waiver schedules only for the semester for which they are authorized. This eliminates the possibility of errors or system crashes, which malevolent attempts would cause. These constraints will allow the department to process waivers more quickly, greatly reducing errors and scheduling changes.

There were a few architectural assumptions. For the proper functioning of the online system, we need to have a web-server up and running and a relational database to store the tables, which will eventually be used to store all the relevant information. I have used the department's existing web-server and database servers for the development of this online system. Portability of the system across various web-servers was an important design constraint.

Every department in the College of Arts and Sciences has a specific set of rules, regulations and permissible exceptions. A system was to be developed that would satisfy all these rules and regulations. Although I did not have access to the NWRDC system to input the waivers, I could gather all information related to input of waivers and checks performed from detailed discussions with Mr. David Gaitros.

CHAPTER 3

Current Process

3.1 Background

A Tuition Waiver is a scholarship that covers the tuition costs of a graduate student. Tuition Waivers are comprised of two components. The In-state or Matriculation Component of a tuition waiver is a mandatory component for all qualifying graduate assistants. Out-of-state waivers are for teaching assistants and research assistants on contracts and grants. A Tuition Waiver covers only the matriculation and out of state portion, 92% of the assessed fees. Tuition Waivers are reserved for full-time, degree-seeking, graduate assistants and fellows. Waivers are cancelled if a student withdraws from the University, drops below the required academic load, or has the assistantship terminated. At Florida State University, all full-time graduate assistants who have at least a one-quarter-time assistantship (teaching or research), or those students on a fellowship are eligible for a tuition waiver.

3.2 An Overview

The university awards tuition waivers to full-time, degree-seeking, graduate assistants and fellows. Graduate students who meet the eligibility requirements qualify for a tuition waiver. These students should be primarily registered for a full course load of study with the university.

Eligible students then fill out a tuition waiver request form with each change in his or her registration. Students submit this request to the Tuition Waiver Coordinator of their department. The Tuition Waiver Coordinator checks these requests for validity (if a student is authorized for

a waiver), accuracy of information and accuracy of the schedule provided, and enters these waivers into the NWRDC system.

3.3 Description Of The Current Process

Students who are authorized a tuition waiver fill out a waiver request form (see Appendix A) for each semester of enrollment. They provide their personal information such as first name, last name, social security number, email, and phone number. They also need to provide accurate information about their status and occupation code. The students also need to give the exact schedule of classes enrolled in, for this schedule should exactly match the schedule for which the waiver is granted.

Students can make several mistakes while filling out the waiver request form. Some of the more common errors include incorrect social security number, incorrect "999" numbers for new international students and occupation code. Students also tend to ask for waiver for courses that are not within the permitted/ authorized set of courses. Also a student cannot ask for a waiver for more than 12 credit hours. There have been cases wherein a student who aspires to get a tuition waiver also submits such a request. This causes confusion and such a request is termed as an invalid request.

After verifying the validity of each waiver request, the Tuition Waiver Coordinator has to enter the correct and accurate information into the NWRDC system to process the waivers. Students are then expected to come in and sign their waiver receipts (see Appendix B).

The Tuition Waiver Coordinator also has to keep track of the money being spent on waiver each term. The Tuition Waiver Coordinator should be able to give an accurate estimate of the funds spent at any given point of time.

This entire current process is paper-centric and prone to errors, resulting in manual checks by the coordinator at every point. This results in an increased consumption in paper, time and other vital resources.

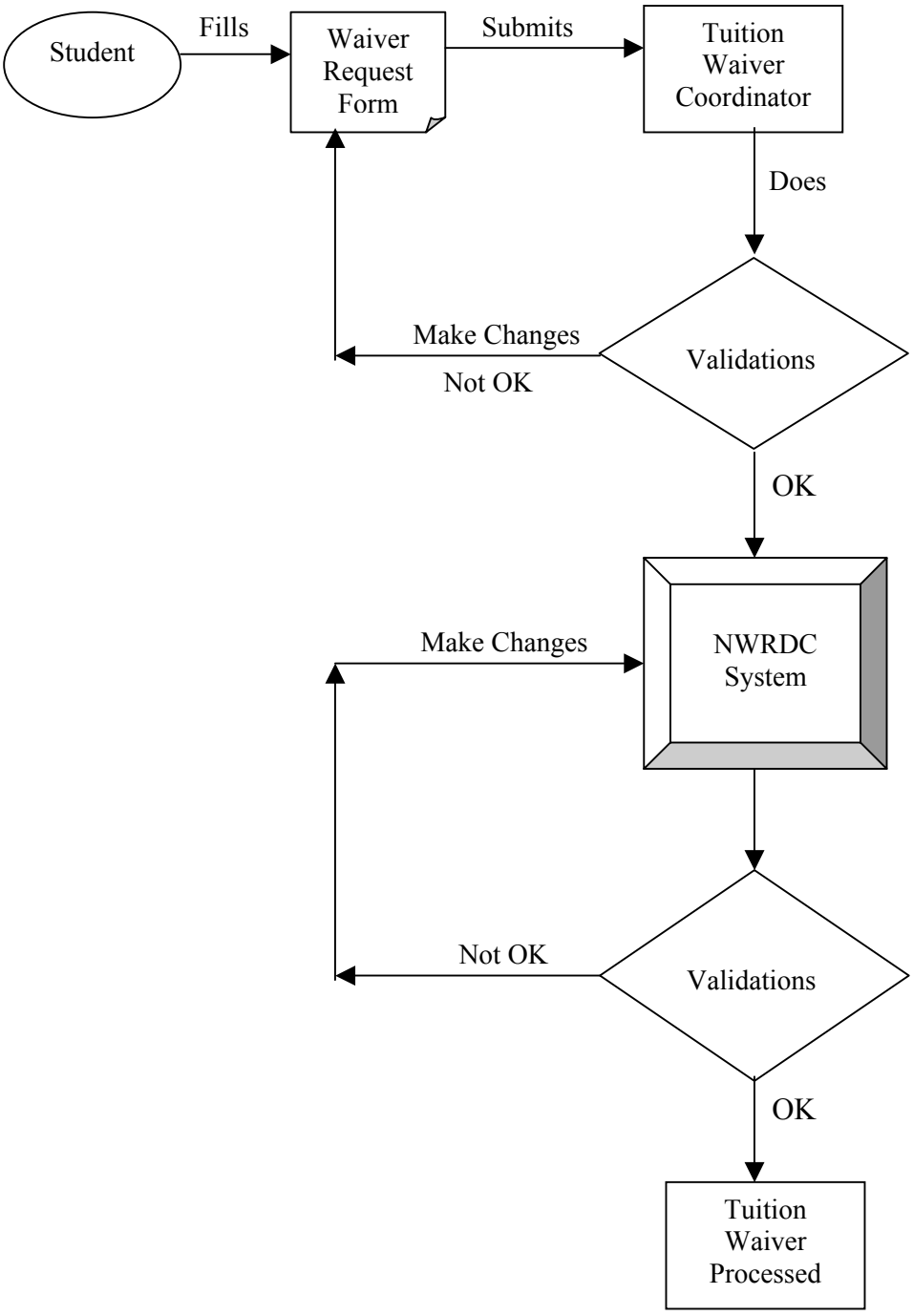


Fig 1. Illustration of the current process of a Tuition Waiver

3.4 Previous Work

Tim Boerner [3], from the Software Engineering Class of Spring 2002 attempted to automate the process of tuition waivers. He visualized that the best way to reduce the errors was to reduce the amount of user-input. According to his design, the system will allow the students to provide a valid waiver request only. The only information they can arbitrarily alter is their email address and telephone number. They can only request waivers for courses for which they are currently registered.

The basic design of his system was a webpage, using Perl as the form handler and generator of dynamic content. The data storage was a flat-file system, which was problematic since the size of the file containing the necessary information would increase as the number of users authorized to use the system increases. Moreover, there could not be any kind of relationship established between the data being stored in the files. A Relational Database was a clear solution to all these issues. Data could be stored in normalized tables, with appropriate relationships among them. Additionally, the system was not developed on a large scale and only a very small prototype version of the actual system was implemented. This system did not handle most of its intended functionality and was not compatible across different browsers. The Tuition Waiver Coordinator was not able to accurately estimate the amount of money being spent on tuition waivers each semester. Though a good attempt, this system was not a fully automated system in its true sense.

I decided to retain the basic concept of Tim Boerner and develop it further. Chapter 5 summarizes the requirements for the new system. The specifications, design and implementation of the new system are discussed in Chapter 6 and 7.

CHAPTER 4

Analysis Of The Current System

In the current system, every student eligible for a tuition waiver fills out and submits a paper application requesting a waiver for the classes enrolled in the current semester. The tuition waiver coordinator needs to check all the applications manually for accuracy of information before entering the waivers in the North West Regional Data Center (NWRDC) system. The existing process is paper-centric and prone to errors, resulting in manual checks by the tuition waiver coordinator at every point.

Students make several mistakes while filling out the waiver request form [Appendix A]. The most common mistake is to indicate the wrong Social Security Number or the "999" number. Students invariably enter wrong numbers, a few of them genuinely forget while there have been cases where this was done deliberately. A few of the students are confused between their last name, first name and middle name. This happens more in the case of international students. Students who are new to the American Education System are often confused with the term 'In-State' and 'Out-of-State'. They very easily confuse the two categories and often indicate the wrong student status. There is a lot of confusion about the occupation code for a particular student too. Students who are newly assigned to an assistantship are not very sure of what exactly is their occupation code and sometimes indicate the wrong occupation code.

A large amount of time is spent handling and verifying these paper applications. First of all, the waiver coordinator needs to wait until he has received the waiver requests from all the eligible candidates. The tuition waiver coordinator then needs to check whether the student requesting a waiver is actually eligible for it. The tuition waiver coordinator needs to check for the accuracy of the name, social security number, status and the occupation code. This is a very tedious and required process. This step ensures that the students profile is correct and has correct information

regarding his student status and occupation code. A correct profile helps the tuition waiver coordinator to have an accurate count of teaching assistants, graders, research assistants, fellows and members of the system administration group.

After the tuition waiver coordinator has performed these checks, the student's schedule of classes needs to be checked for accuracy. One can request to waive a course only if it belongs to the set of permitted courses, pre-decided by the department. Courses in this list count towards the required 32 hours for the MS degree in Computer Science.

Before submitting the paper request, the student should finalize his schedule of classes. Students often tend to make changes to their class schedule even after submitting the application for tuition waiver. The tuition waiver coordinator thus needs to check if the class schedule on the waiver application matches the students actual class schedule as reflected in the registrar's database. A student can request to waive a maximum of 12 credit hours only. This is a very important check and the coordinator needs to perform all these checks manually.

There have been instances in the past wherein students submit a waiver application and then altered their class schedule to add unauthorized classes. As a result, these applications need to be checked for accuracy of information, and correct class schedule, before this information is entered into the NWRDC system. To make matters worse, handwritten forms are frequently hard to decipher and inaccurate.

Mr. David Gaitros, the tuition waiver coordinator for the Department of Computer Science, gets a set of waiver numbers allotted for the department every semester from Jon Bridges in the Academic Support Services. He then maintains a log of waiver numbers issued to the students and needs to ensure that he does not issue the same waiver number to more than one student. Mr. Gaitros then enters the information into the NWRDC system after he has performed all these checks.

Students put off submitting their waiver requests and finalizing their schedules until the last minute. This results in a time crunch for the tuition waiver coordinators during the busiest time

of the semester. The coordinator also needs to keep a track of the money being spent every semester. Mr. Gaitros maintains an EXCEL sheet, including all relevant information for a student as well as the tuition fees paid. He updates this sheet often and needs to manually total up the money spent every semester.

After checking all the waiver applications and inputting the details into the NWRDC system, Mr. Gaitros then prints out waiver receipts for each student and the student needs to sign his copy of the receipt. Mr. Gaitros also needs to file each of these waiver applications every semester. As seen, the entire process is paper-centric and prone to errors, resulting in manual checks by the coordinator at every point. This results in an increased consumption in paper, time and other vital resources.

Chapter 5 summarizes the requirements of a new online system for processing tuition waiver requests. The new online system was designed to greatly decrease the administrative workload, and be an efficient and accurate Tuition Funds Management Tool.

CHAPTER 5

Requirements

5.1 Overview

A careful analysis of the current system and its associated disadvantages along with the overheads of resource, time and money management strongly motivated the concept and development of an automated system. The proposed system should be aimed to reduce the administrative workload and serve as an efficient Tuition Funds Management Tool.

Requirements for the development of this new system were gathered from the analysis of the current system, and detailed discussions with Mr. David Gaitros, the Tuition Waiver Coordinator of the Department of Computer Science at Florida State University. It was decided and agreed upon that the new/proposed system should be an automated, Web-enabled system. Automation would be possible because the entire tuition waiver process is well laid out. There are clear-cut algorithms defined for each step in the process. Each step in the process can be implemented as an atomic process in the new automated, web-enabled system. Also, web enabling the entire process would reduce the amount of paper used and also give the students the ability to remotely create, update or view their waiver schedules.

5.2 Functional Requirements

The aim of this project was to build an automated, web-enabled system, which should overcome the disadvantages of the current system. Web-enabling the new system would eventually lead to a paperless system and save on a lot of time, money, paper and many other resources. The proposed system should be able to do an automatic check for various criteria before allowing the student to submit his /her waiver application.

The proposed system, Graduate Tuition Waiver System, should consist of two main portals – The Student Portal and The Administrator Portal. The tuition waiver coordinator needs to be the administrator who should have complete super user access to the system. Appropriate security measures should be taken so that students do not abuse the system. Only persons authorized to use the system, authorized students eligible for a waiver and authorized waiver coordinators who process tuition waivers, should be allowed to use it. This would be a very effective mechanism to restrict access to eligible users only.

The coordinator should be able to create a profile for every student who is authorized a tuition waiver. This profile should consist of the student's complete name, social security number, academic status, occupation code, full time equivalency (FTE) and the appointment funding number. Students whose profiles exist in the database should be allowed access to the system and submit applications requesting a tuition waiver. By doing so, we would ensure that only eligible students are allowed access to the system and this would also eliminate all the human errors caused by manual input of details.

The coordinator should also have the ability to edit a student's information. Students should be allowed to select the courses from a database of courses designed by the department. Only those courses that would count towards the 32 credit hours for a MS degree in Computer Science would be added to this database of authorized courses. The coordinator should be able to add courses, edit course information and even delete old or outdated courses from this database.

As an administrator, the tuition waiver coordinator should be able to view waivers for all the students. He should be able to view and print waiver summaries. The Waiver Summary for a particular term/year would indicate the total amount of money spent on tuition waivers for that term/year. This would be of immense use since the coordinator would be able to quickly pull an accurate estimate of the money spent on tuition waivers at any given point of time. The coordinator should also be able to print waiver receipts for each student every semester.

Mr. David Gaitros receives a set of pre-allotted waiver numbers from Jon Bridges in the Academic Support Services. There should be a mechanism by which he should be able to allot

these waiver numbers to the currently active candidates dynamically. The new system should also permit the coordinator to deactivate / reactivate students. The system should also let the administrator control the period of time for input of waiver schedule by the eligible students.

5.3 Non-Functional Requirements

The objective of developing The Graduate Tuition Waiver System was to make the entire process simple, easy and effective. Hence, there had to be a conscious effort to keep the new process as simple and user-friendly as possible. Only pertinent and required information should be displayed on the various screens of the application.

Students should not have a problem or be skeptical about using the system. The background color and text properties have to be carefully decided and the application should not take a long time to execute. The web pages of the web-enabled application, contents and images, should take minimum time to download. The application should run error-free across all browsers – Internet Explorer, Netscape Navigator, Mozilla. The user – interface of the application should adhere to all the User Interface design principles. The user should be prompted with an error message and a probable solution in case of an error.

The tuition waiver coordinator needs to have global access across the application. He should be able to edit any student's information, waiver schedule and course information. The options for the user should be very simple, clear and intuitive. The system should be able to provide online help and documentation for the users who would have trouble accessing the application.

5.4 Hardware Requirements

For successful functioning of this new system we would need a fully operational web-server and a relational database server. The web-server should be set up such that it can handle multiple clients at the same time. It should be a non-blocking server. The database server should be able to allow multiple database connections at the same time. The system would require the use of a

relational database as a back-end to store all the necessary information. Various normalized tables need to be created to store student's information and waiver schedules.

There needs to be a system that would maintain backups of the web-server and database servers at specific intervals for archival purposes. The database should be large enough to hold related information for all the students for all the semesters of enrollment. The users, administrators and students, will be required to use computers which have a browser to browse web pages and should be able to connect to the Internet.

Chapter 6 summarizes the specifications of the Graduate Tuition Waiver System and chapter 7 discusses in detail the design and implementation of the system.

CHAPTER 6

Specifications

6.1 Overview

This section summarizes the specifications for the Graduate Tuition Waiver System. An exhaustive study of the current process and its associated drawbacks motivated the need for the development of a new automated system. The new system will serve as an efficient Tuition Funds Management Tool, reducing the administrative workload for the tuition waiver coordinator. The following sections describe the various technical and non-technical specifications of the new system.

6.2 A Web-Enabled Automated System

The current paper-based system not only uses a lot of time, money and other resources, but also is prone to human errors at every stage. Automation of the current process of tuition waivers was possible because of the clear-cut algorithms defined for each step. Each step in the process is implemented as an atomic process in the new automated, web-enabled system.

A centralized system will help in consolidating all information related to waiver schedules of graduate students and information related to the amount of money spent on tuition waivers at any given point of time into one application. Making this system accessible via the Internet will help students and coordinators to access the system remotely using a web browser. Students and Tuition Waiver Coordinators will have specific login profiles to access the new online Graduate Tuition Waiver System. This system will drastically reduce the administrative workload for the coordinator and serve as an efficient tuition funds management tool.

6.3 Super User Access To The Coordinator

The tuition waiver coordinator will have super-user access to the system and privileges to create and delete profiles for eligible graduate students. Students, whose profiles exist in the database, will have restricted access to the system and will be able to view and update their information only. The coordinator will also have the ability to modify students' profiles, deactivate students, reactivate currently inactive students and modify waiver schedules. The coordinator will be able to pull up quick waiver summaries and print waiver receipts for any given student for any given term-year.

The coordinator will be able to grant or revoke access rights for students to create, update or delete waiver schedules for permitted semesters. The coordinator will also have access to the database of pre-approved courses, which will count towards the successful completion of the Masters degree. The tuition waiver coordinator will be able to add new courses, modify course descriptions and delete courses from this database.

6.4 Student Side Specifications

The tuition waiver coordinator will create profiles for all eligible students in the database. These eligible students will have access to the new system using their Social Security Number as their username and a preset password. They will be able to reset the password after a first login. Students will be able to create, view or update waiver schedules for only those semesters for which they have access. Students will not be able to make any modifications to their waiver schedules after the coordinator has revoked access.

6.5 Other Specifications

The new system will be a normal web application wherein the users need to follow simple instructions in English. The user is expected to have some basic knowledge of computers and Internet technologies. Conscious efforts have been made to keep the new system as simple as

possible. Only pertinent and required information will be displayed on various screens. The user-interface of the system shall adhere to User Interface Design Principles.

Error messages for wrong input and non-permitted actions will be well expressed and the reactive measures suggested shall be intuitive and simple to follow. The application shall not take a long time to execute. Any student / coordinator shall be able to log on the application and access it remotely using any web browser and an Internet connection.

We will need a fully functional web-server to host the web-applications. I decided to use the department's Web Server - an Apache Web Server running on a Linux machine. This server is a non-blocking server and will accept multiple connections. We also need a relational database to store all the data in normalized tables. I have used the department's database server, a MySql server 12.21 running on a Linux Box, to create my database and required tables. The database supports multiple database connections simultaneously. There is scope for extensibility if the data stored in the tables grows too large.

CHAPTER 7

Design And Implementation

7.1 Design

The new Graduate Tuition Waiver System is a web-based application. The system primarily consists of three portals – The Administrator Portal, The Student Portal and The Courses Portal. I have used Perl as the dynamic web content generator. All information / data is stored in MySql tables on a MySql server. JavaScript is used for client-side validations and the application is browser independent. Separating the student portal from the administrator portal helped in increased security by not allowing the students to accidentally access the administrator side. Section 7.2 describes in detail the tables created and the relationships between them. Section 7.3 describes the various sections of the Administrator and Student Portals.

7.2 Database Design

The Graduate Tuition Waiver System uses the following tables: *administrator, cs_permitted_courses, fees_table, student_course_info, student_waiver_info and waiver_terms*. The table *administrator* contains records for all the authorized tuition waiver coordinators / administrators for the Department of Computer Science who will have super user access to the Graduate Tuition Waiver System. Login attempts to the Administrator portal are checked for validity against records in this table. *Appendix C* shows the table structure for all the tables and shows the relationship between the various tables.

The courses that count towards the required 32 credit hours for the MS degree in Computer Science are stored in the table *cs_permitted_courses*. The tuition waiver coordinator can add / update / delete courses. Courses existing in this table are pulled up dynamically in the drop down

list for permitted courses in the add/update waiver schedule screen. This database can be accessed using an online form at http://www.cs.fsu.edu/gtws/newcourses.cgi using the same username and password combination as that of the administrator portal.

The undergraduate and graduate level matriculation and out of state costs are stored in a table *fees_table*. Tuition waiver coordinators have access to this table and can change these values as and when the university revises the fees. This feature is one of the four options available in the courses portal. The values in the respective fields in this table are used to calculate the total matriculation and out of state costs covered for all eligible graduate students.

The table *waiver_terms* contains an entry for each term-year for which the tuition waiver coordinator has either granted / revoked access to the students for creating / updating and viewing waiver schedules.

There exists a record in table *student_waiver_info* for each eligible student, which is created as the student is added to the database by the tuition waiver coordinator. This record contains all the necessary information required to create a profile for the student. Table *student_course_info* contains information regarding the courses and the credit hours for each course, along with some more information regarding the schedule of classes the student has enrolled for any given term-year. Each student in the table *student_waiver_info* has one or more records in the table *student_course_info*.

7.3 Software Design

The entire project is split into three main applications – the student portal, the administrator portal and the courses portal. Authorized students log into the application using their social security number as the username, with a preset password (the last 4 digits of the social security number). Administrators and Tuition Waiver Coordinators have access to the administrator and courses portal using a unique username – password combination. The following sections describe in detail the design and functionality of these portals.

7.3.1 Student Portal

The tuition waiver coordinator creates a profile for each student who is eligible for a tuition waiver. Students log into the Student Portal at http://www.cs.fsu.edu/gtws/student.cgi using their social security number as the username and a preset password (the last four digits of the social security number). Students can change their passwords after their first login. Fig 2 shows a snapshot of the Login Screen for the Student Portal.

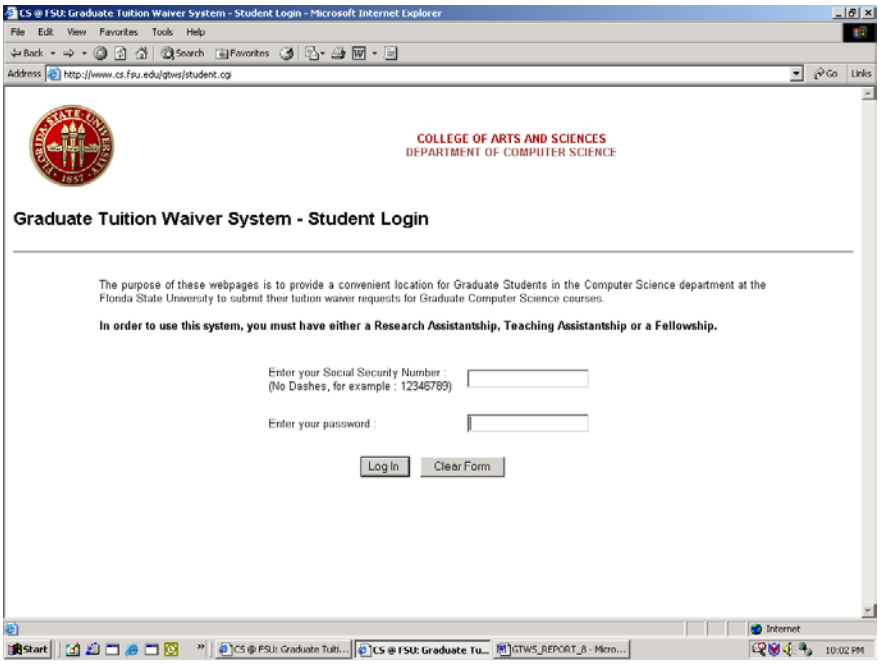


Fig 2: Login Screen of the Student Portal

Various checks need to be performed at this time. The application first checks to see if the student attempting the login is an authorized user of the system. Appropriate error messages are displayed if the student is not eligible for a waiver. It also checks to see if the password entered by the student matches the one in the record in the database. Another simple check performed was to see if a blank password was entered. The system also should also prevent deactivated students from creating / modifying their waiver schedules.

After authentication, the main screen of the student portal is loaded. This screen gives the user three choices. One can choose between creating a new schedule, updating an already existing schedule, or viewing an already created schedule.

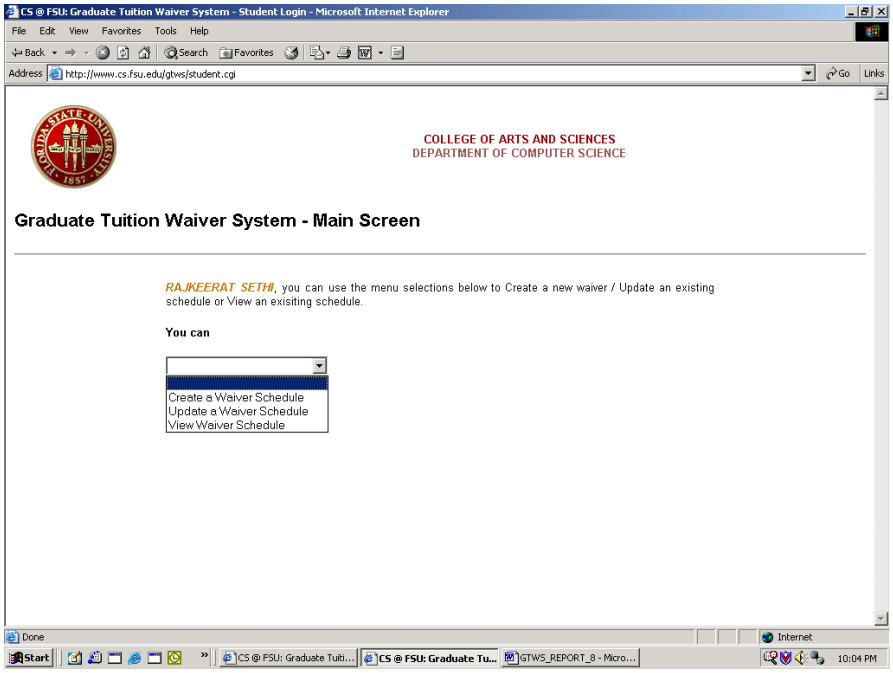


Fig 3: Main Screen of Student Portal

The student will be able to create a waiver schedule for the term-year for which the Coordinator has granted access to. The term and year are automatically populated when access is granted or revoked for a particular term [*Fig 4*].

In this screen all information that was entered by the coordinator while creating the student's profile is displayed. The student can edit this information if required. The student can also change his password here if desired. The student will be permitted to choose from the list of permitted courses in the Department of Computer Science. This list is created dynamically by pulling up all the existing active records in the *cs_permitted_courses* table, which is maintained by the tuition coordinator. A check is performed to see if the credit hours associated with the courses are correct. If there is any kind of discrepancy, an appropriate error message is displayed

on the screen. The total number of credit hours being signed up cannot exceed 12 credit hours and the student portal performs this check before submitting the form.

The student also needs to indicate whether he/she is taking a full load of courses in that current term. The application does not permit a student to create more than one waiver schedule for a given term-year. If this is attempted, an error message is displayed indicating the student to go and update the schedule instead.

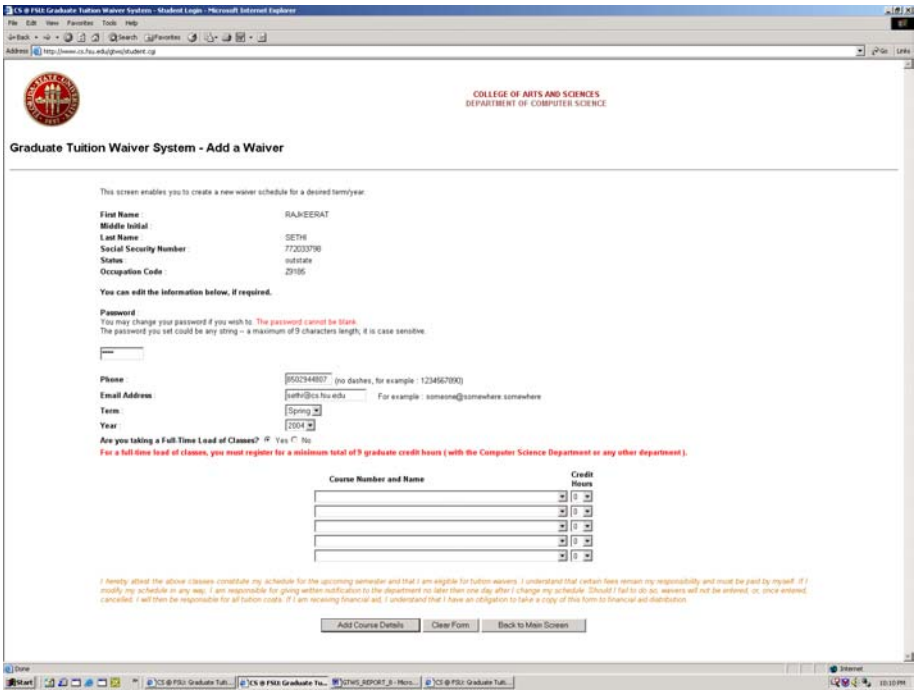


Fig 4: Add a Waiver Screen of the Student Portal

The second option enables the student to update the waiver schedule for the term/year for which the coordinator has granted access. The update screen resembles the create waiver screen [Appendix C4]. Checks performed in the update waiver module are similar to those in the create waiver module. The third option displays a read - only version of the waiver schedule for that permitted term-year [Appendix C5]. The student will have the ability to update this schedule from this screen.

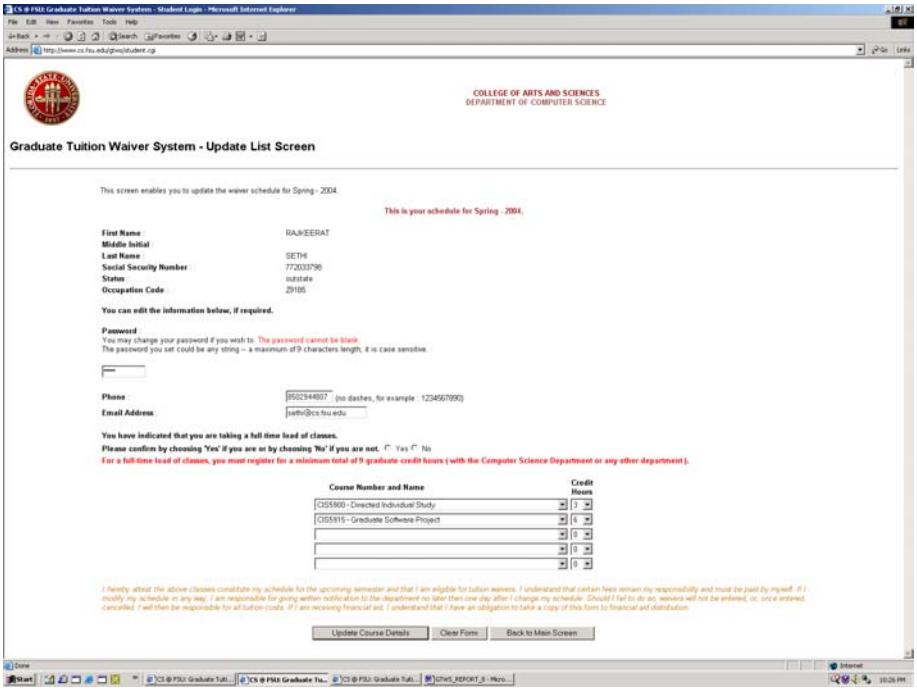


Fig 5: Update Waiver Screen of the Student Portal

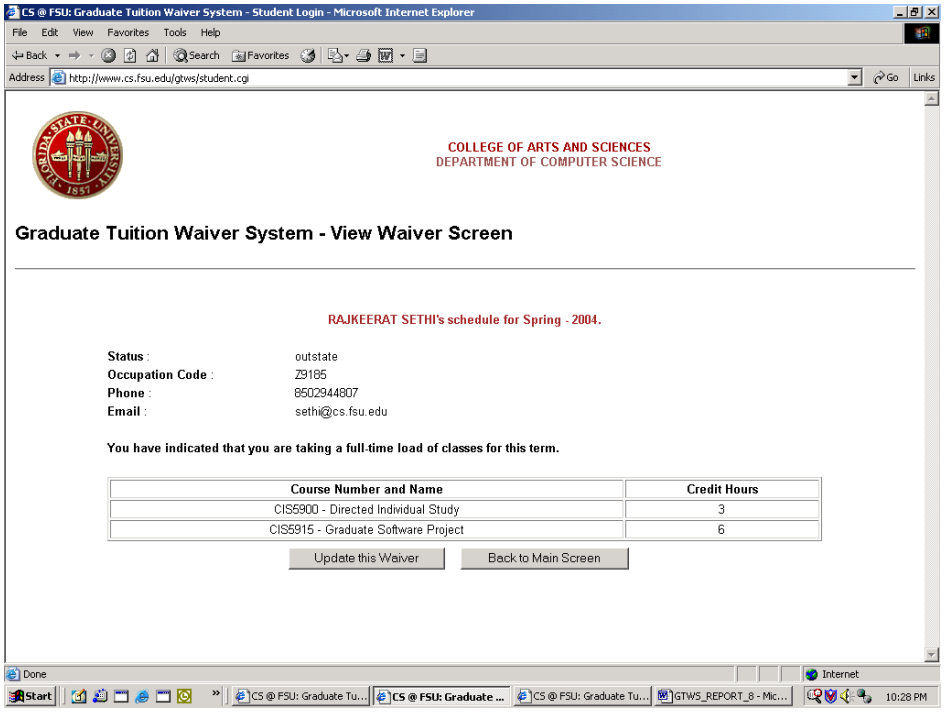


Fig 6: View Waiver Screen of the Student Portal

7.3.2 Administrator Portal

The tuition waiver coordinator can log into the Administrator Portal at http://www.cs.fsu.edu/gtws/admin.cgi using the given username - password combination.

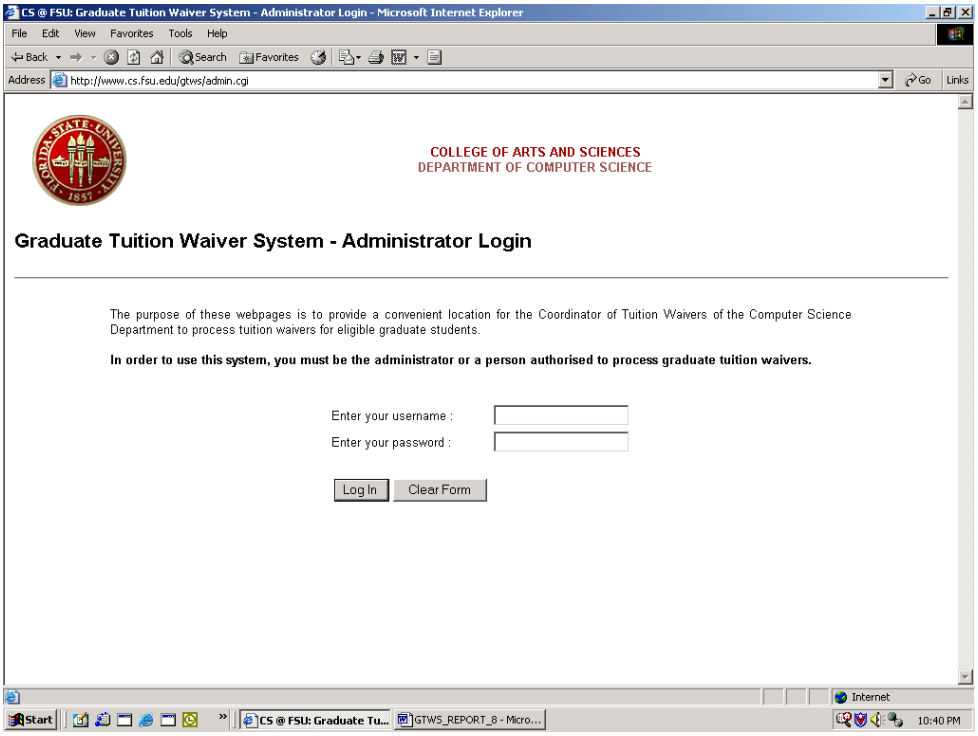


Fig 7: Login Screen of the Administrator Portal

The username – password combination should be a valid entry in the database, failing which an error message is displayed requesting the user to try again using a valid combination. After verifying the identity of the user, the system loads the main screen of the application [*Fig 8*].

The first option in the drop down box enables the coordinator to grant / revoke permissions to the students to create waiver schedules for a particular term – year [*Fig 9*]. The coordinator can select the term – year he wants to grant access for or revoke access for.

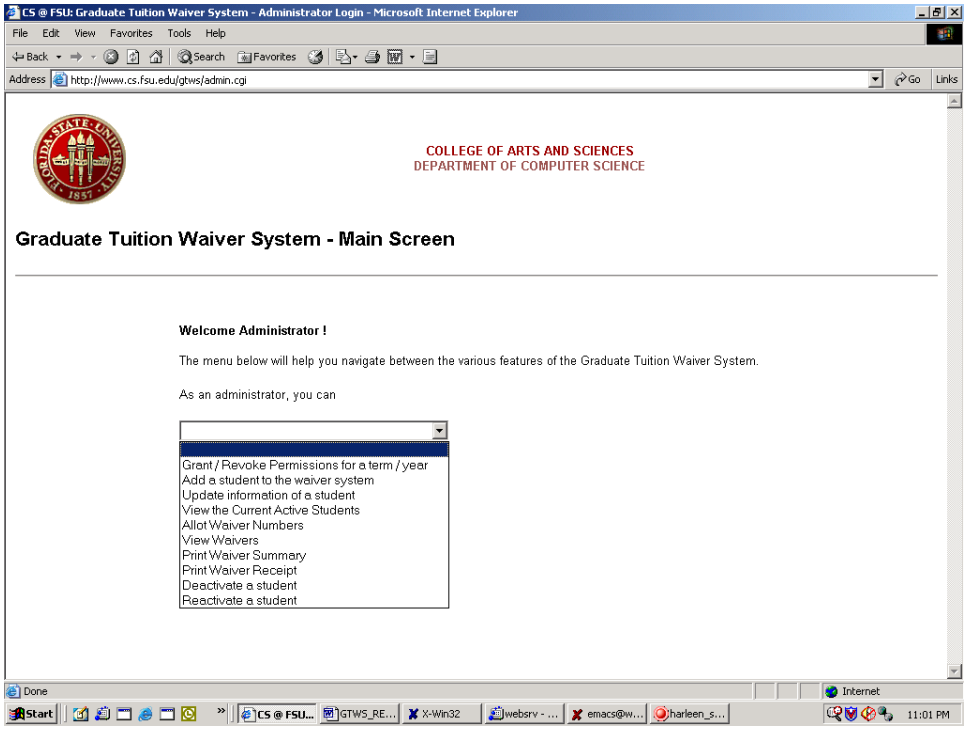


Fig 8: Main Screen of the Administrator Portal

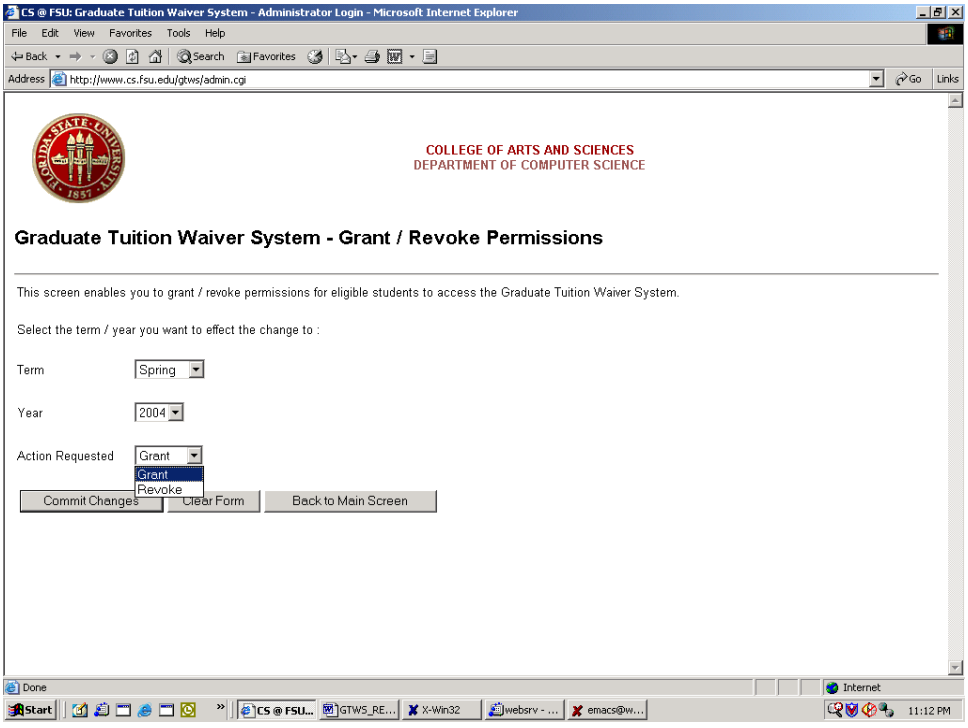


Fig 9: Grant / Revoke Permissions Screen of the Administrator Portal

Students eligible for a tuition waiver are added to the system using the second option. The coordinator fills in the form shown in *Fig 10* to add new students. The coordinator needs to provide the basic information such as the student's first and last name, social security number, status, occupation code, email address, phone number, full time equivalency and the appointment funding number. The application checks for valid entries into all these fields before submitting the form. Appropriate error messages are displayed, and the user is prompted to correct them before proceeding.

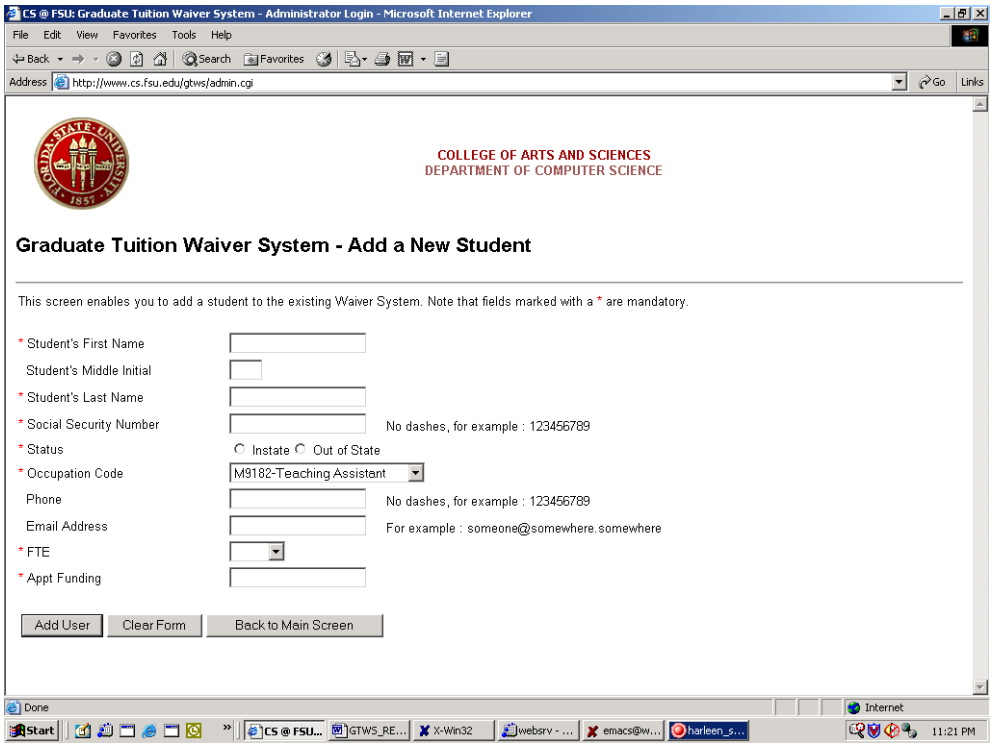


Fig 10: Add a New Student Screen of the Administrator Portal

The tuition waiver coordinator can update student's information by selecting the third option from the main menu. The coordinator can then select the specific student whose profile needs to be updated from the "Update Information Screen". This brings up the profile and the screen looks very similar to the "Add a New Student" screen [*Fig 11*]. The coordinator can then update information and then commit these changes. Checks performed in this module are very similar to the "Add a New Student" module. The coordinator has the option of viewing a list of currently active students [*Fig 11*]. Students are termed as "active" if they are currently eligible for a tuition waiver.

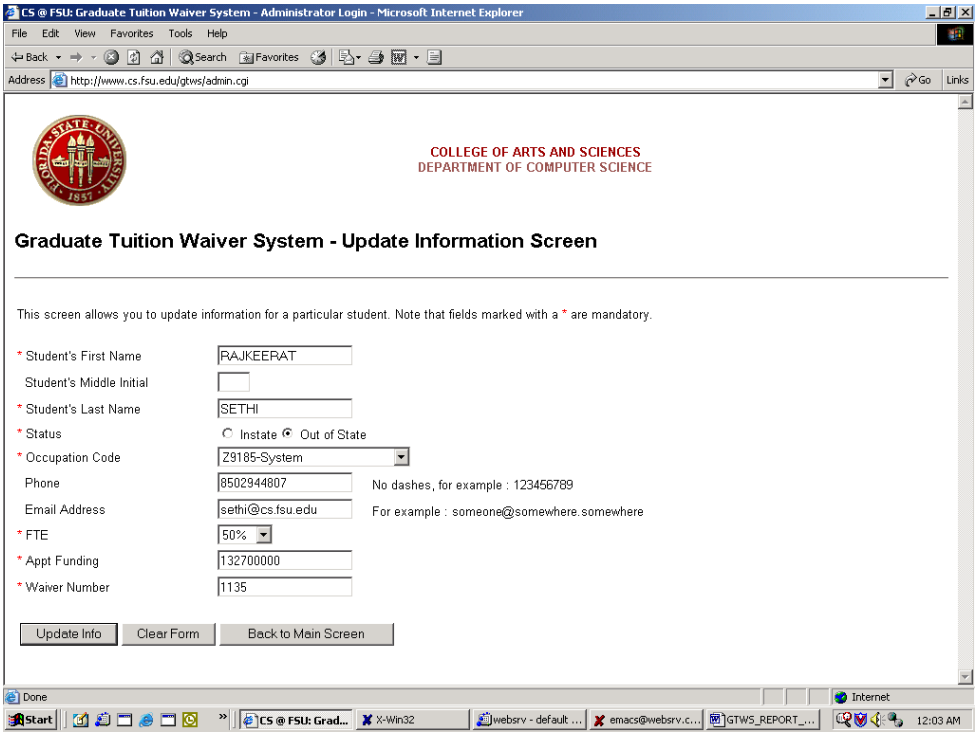
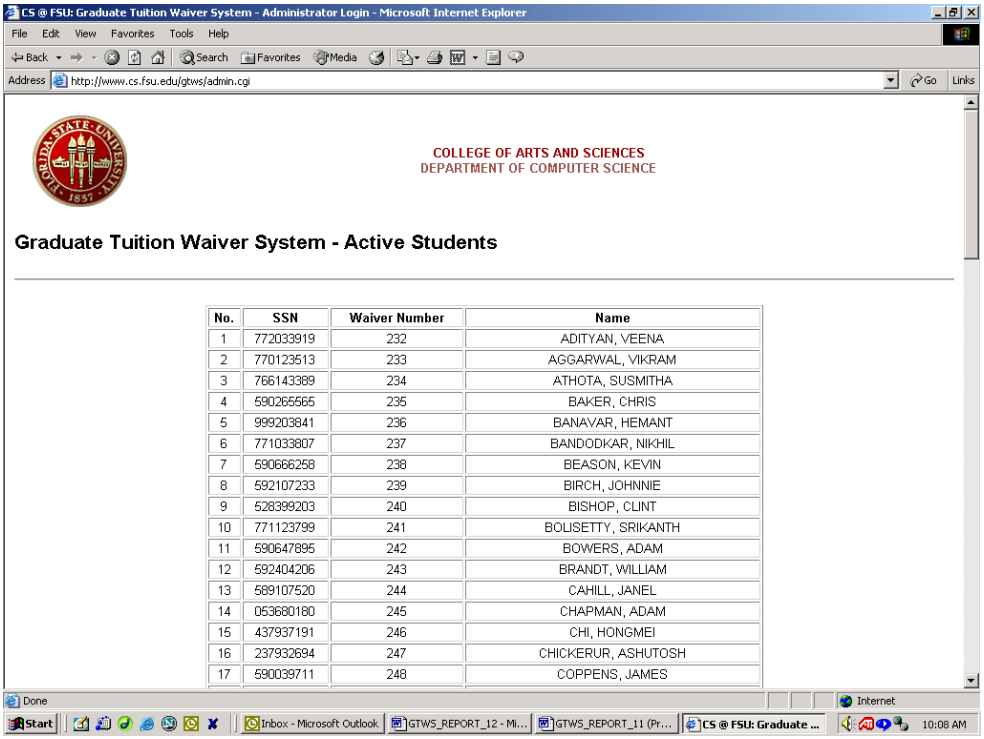


Fig 11: Update Information Screen of the Administrator Portal



No.	SSN	Waiver Number	Name
1	772033919	232	ADITYAN, VEENA
2	770123513	233	AGGARWAL, VIKRAM
3	766143389	234	ATHOTA, SUSMITHA
4	590265565	235	BAKER, CHRIS
5	999203841	236	BANAVAR, HEMANT
6	771033807	237	BANDODKAR, NIKHIL
7	590666258	238	BEASON, KEVIN
8	592107233	239	BIRCH, JOHNNIE
9	528399203	240	BISHOP, CLINT
10	771123799	241	BOLISETTY, SRIKANTH
11	590647895	242	BOWERS, ADAM
12	592404206	243	BRANDT, WILLIAM
13	589107520	244	CAHILL, JANEL
14	053680180	245	CHAPMAN, ADAM
15	437937191	246	CHI, HONGMEI
16	237932694	247	CHICKERUR, ASHUTOSH
17	590039711	248	COPPENS, JAMES

Fig 12: A list of active students

Mr. David Gaitros, the tuition waiver coordinator for the Department of Computer Science, gets a set of waiver numbers allotted for the department every semester from Jon Bridges in the Academic Support Services. He assigns these waiver numbers to the active students using the fifth option from the main screen. The Waiver Number Generation Screen [*Fig 12*] is used to allot waiver numbers. Appropriate checks need to be performed before this form is submitted. The minimum value of a range should be greater than the maximum value of the previous range.

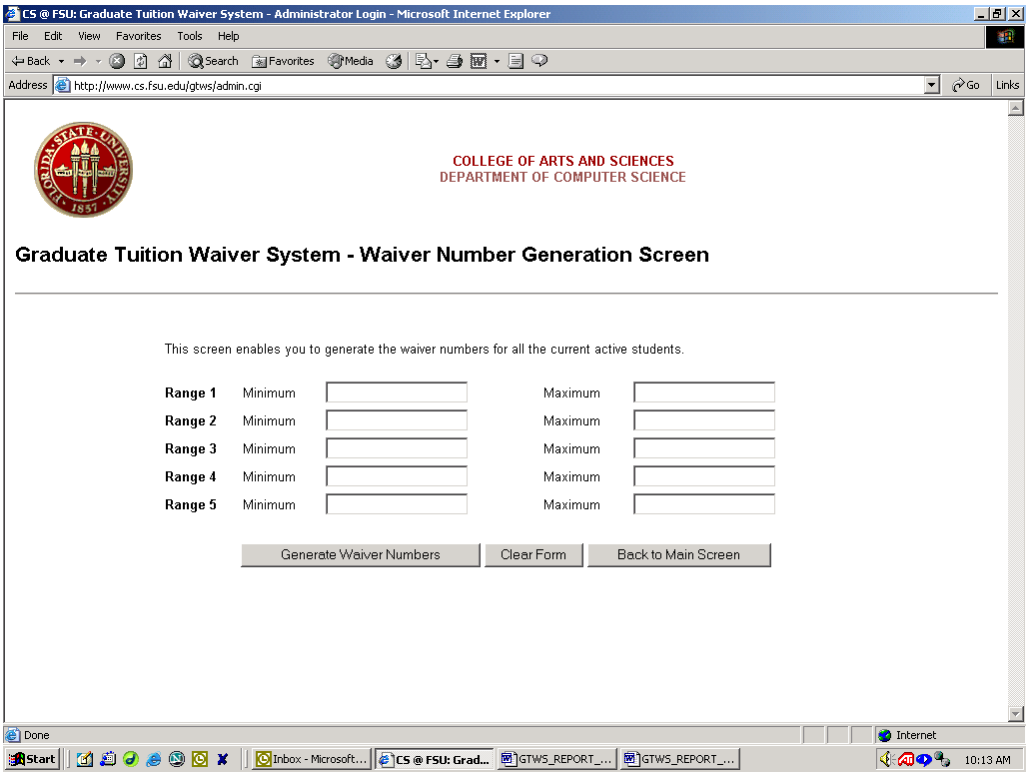


Fig 12: Waiver Number Generation Screen of the Administrator Portal

The tuition waiver coordinator uses the sixth option in the main screen to view waivers for a student. The View Waiver Selection Screen [*Fig 13*] helps the coordinator to pull up the waiver schedule of a particular student for a particular term - year.

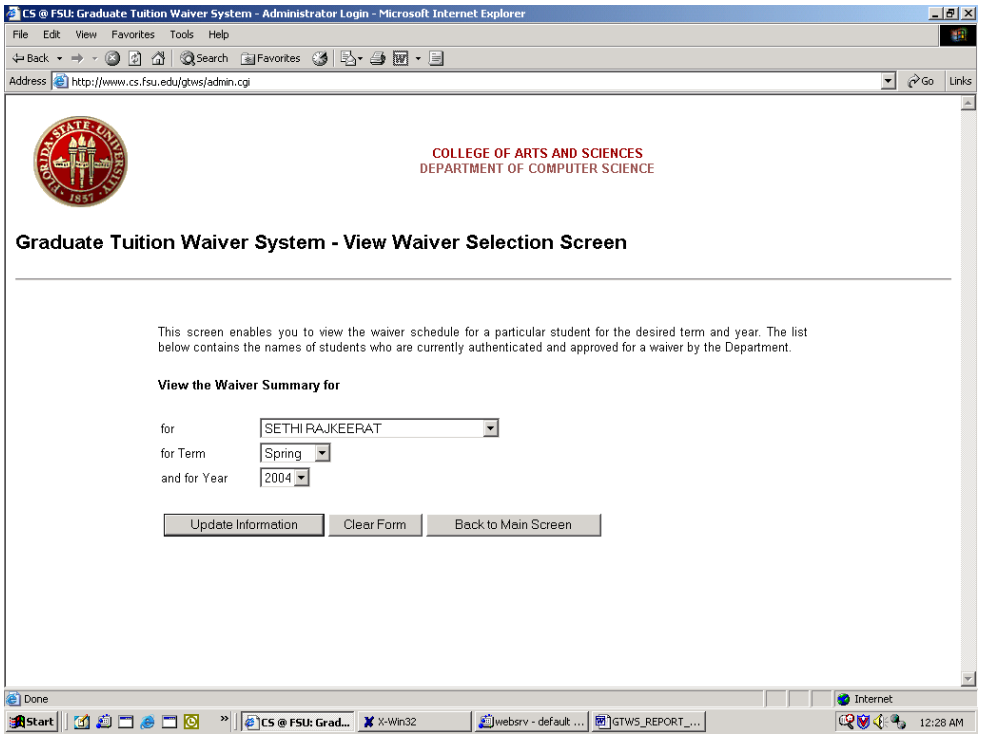


Fig 13: View Waiver Selection Screen of the Administrator Portal

The waiver schedule is then displayed as in *Figure 14* and the coordinator can update this schedule by clicking on the "Update this Waiver" button. *Figure 15* shows the screenshot of the "Update Waiver Screen". The coordinator has the super-user privileges to update a student's waiver schedule. The coordinator can also add special courses to the waiver schedule of the student, under special recommendations from the major professor or graduate advisor of the student. These special courses are not in the set of pre-approved courses. The system checks for the total number of credit hours registered for before submitting this form. One cannot request for a tuition waiver for more than 12 credit hours of course load.

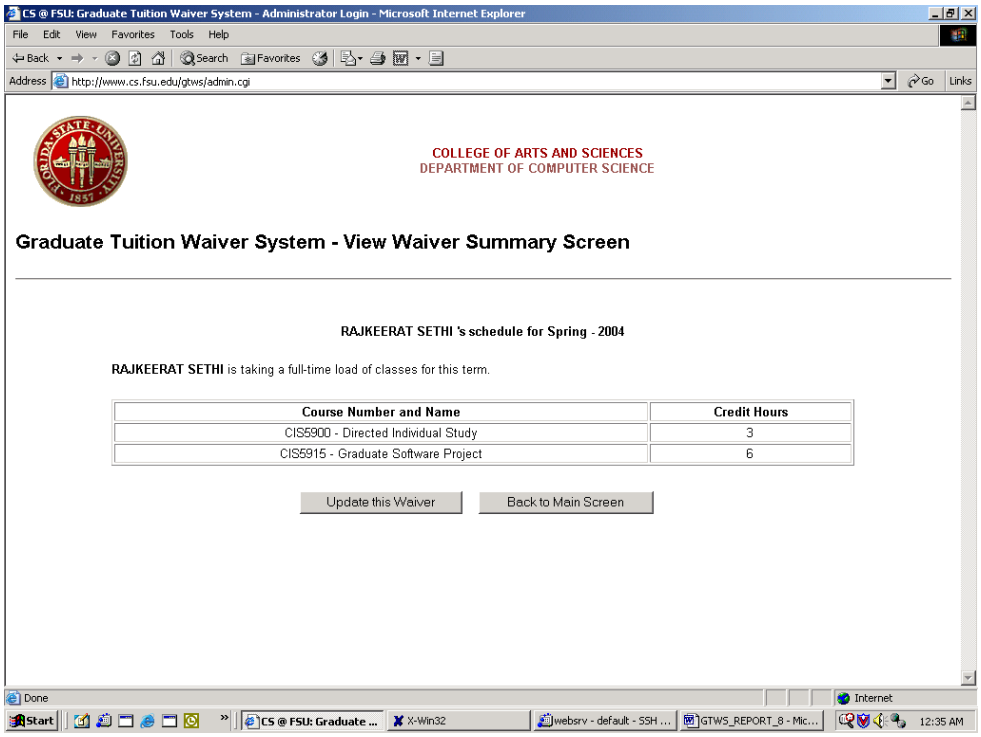


Fig 14: View Waiver Summary Screen of the Administrator Portal

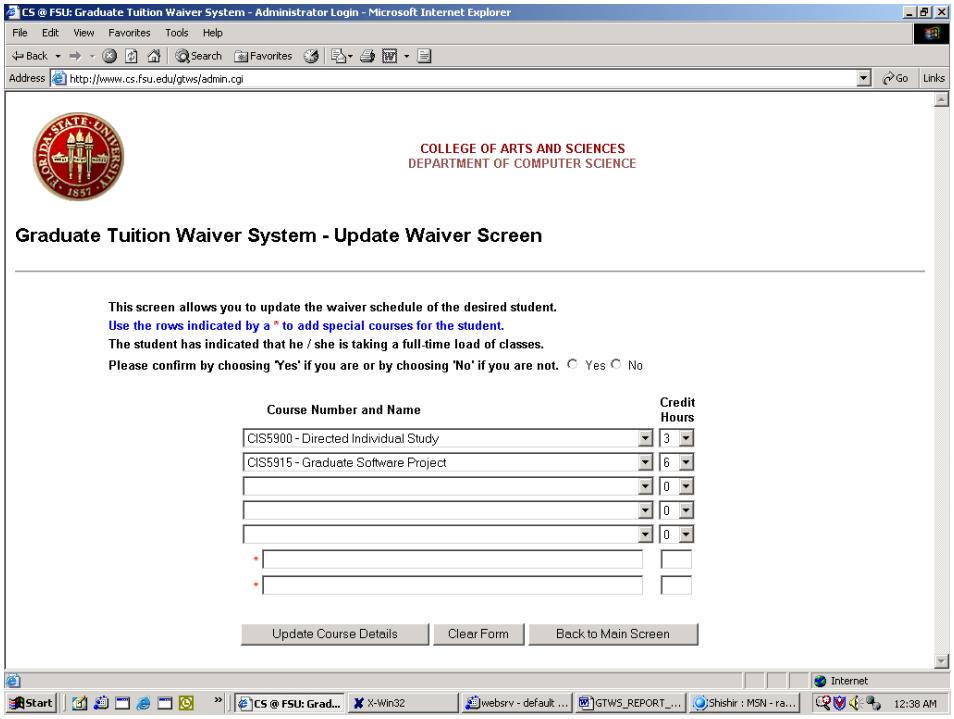


Fig 15: Update Waiver Screen of the Administrator Portal

One important advantage of the Graduate Tuition Waiver System is that it serves as an excellent Tuition Funds Management Tool. Option seven in the main screen helps the coordinator to print waiver summaries for a particular term – year [*Fig 16*]. *Figure 17* shows a screenshot of the waiver summary for the selected term – year. The waiver summary shows a list of all the students along with the details regarding the number of credit hours registered. The most important aspect of this summary is the calculation of the total money spent on tuition waiver, including the individual split of the matriculation and out of state components of the waiver. This summary helps the coordinator to pull up a quick and accurate estimate of the money spent on tuition waivers at any given point of time.

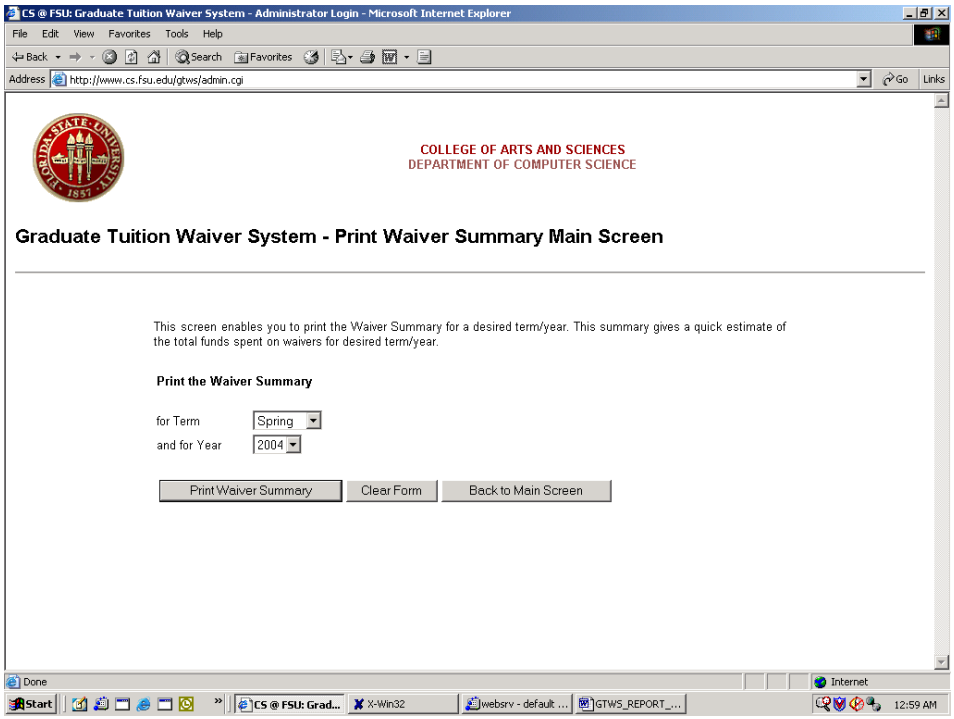
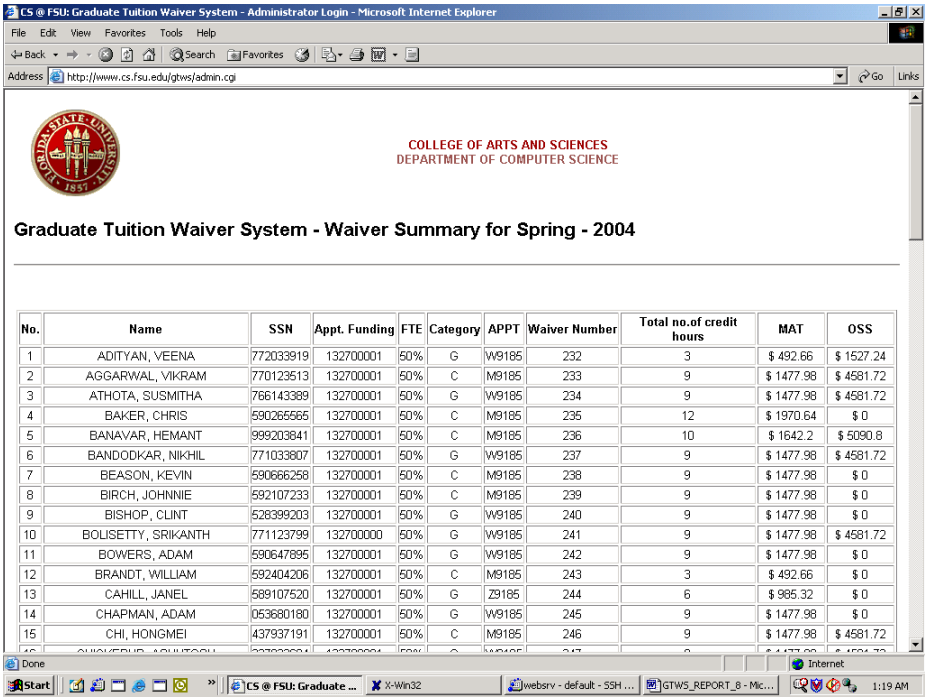


Fig 16: Print Waiver Summary Main Screen of the Administrator Portal

The Graduate Tuition Waiver System also allows the coordinator to print waiver receipts for a particular student for a specific term – year. The coordinator can select a particular student from a list of active students and print the waiver receipt for that student for a given term – year [*Fig 18*]. The waiver receipt summary for the selected student is then printed out and the student signs this receipt [*Fig 19*].



No.	Name	SSN	Appt. Funding	FTE	Category	APPT	Waiver Number	Total no.of credit hours	MAT	OSS
1	ADITYAN, VEENA	772033919	132700001	50%	G	W9185	232	3	$ 492.66	$ 1527.24
2	AGGARWAL, VIKRAM	770123513	132700001	50%	C	M9185	233	9	$ 1477.98	$ 4581.72
3	ATHOTA, SUSMITHA	766143389	132700001	50%	G	W9185	234	9	$ 1477.98	$ 4581.72
4	BAKER, CHRIS	590265565	132700001	50%	C	M9185	235	12	$ 1970.64	$ 0
5	BANAVAR, HEMANT	999203841	132700001	50%	C	M9185	236	10	$ 1642.2	$ 5090.8
6	BANDODKAR, NIKHIL	771033807	132700001	50%	G	W9185	237	9	$ 1477.98	$ 4581.72
7	BEASON, KEVIN	590666258	132700001	50%	C	M9185	238	9	$ 1477.98	$ 0
8	BIRCH, JOHNNIE	592107233	132700001	50%	C	M9185	239	9	$ 1477.98	$ 0
9	BISHOP, CLINT	528399203	132700001	50%	G	W9185	240	9	$ 1477.98	$ 0
10	BOLISETTY, SRIKANTH	771123799	132700000	50%	G	W9185	241	9	$ 1477.98	$ 4581.72
11	BOWERS, ADAM	590647895	132700001	50%	G	W9185	242	9	$ 1477.98	$ 0
12	BRANDT, WILLIAM	592404206	132700001	50%	C	M9185	243	3	$ 492.66	$ 0
13	CAHILL, JANEL	589107520	132700001	50%	G	Z9185	244	6	$ 985.32	$ 0
14	CHAPMAN, ADAM	053680180	132700001	50%	G	W9185	245	9	$ 1477.98	$ 0
15	CHI, HONGMEI	437937191	132700001	50%	C	M9185	246	9	$ 1477.98	$ 4581.72

Fig 17: Waiver Summary Screen of the Administrator Portal

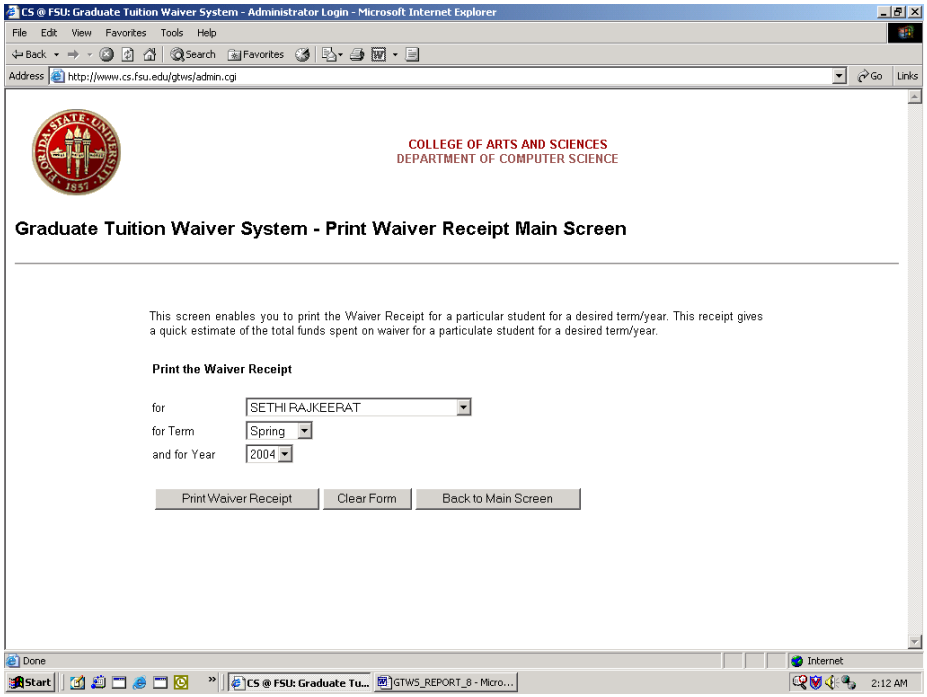


Fig 18: Print Waiver Receipt Main Screen of the Administrator Portal

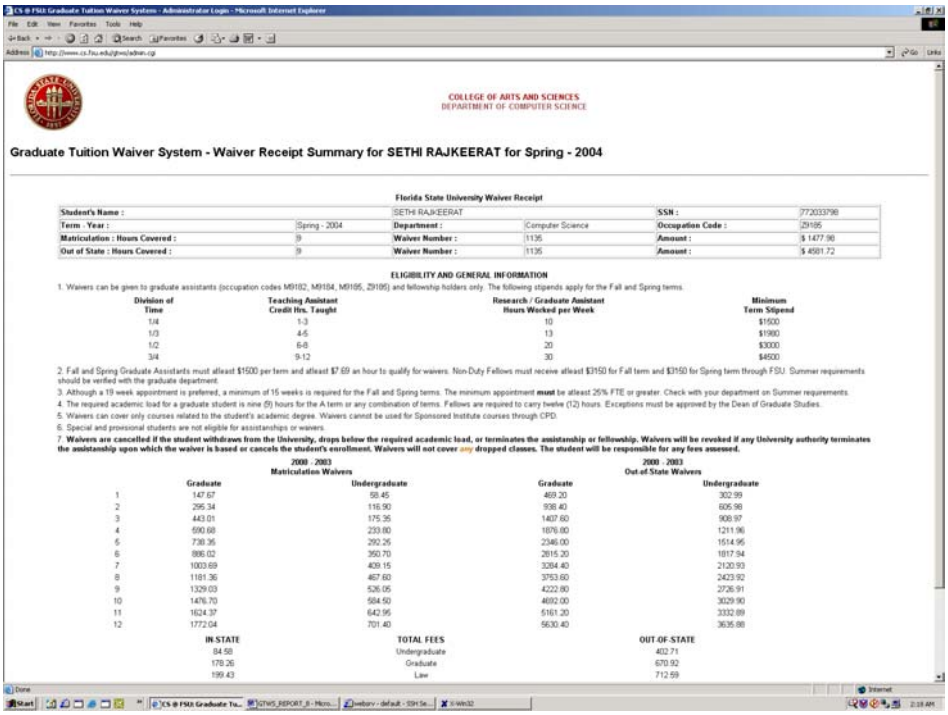


Fig 19: Waiver Receipt Summary Screen of the Administrator Portal

Students who graduate, or for some reason become ineligible for a tuition waiver need to be deactivated from the system. A few of the reasons why students become ineligible are poor GPA and too few courses for a full load of study. Tuition Waiver Coordinators can opt to deactivate students by selecting the ninth option from the main screen. The coordinator can then select the student to be deactivated from a list of currently active students [*Fig 20*].

Students who have been deactivated can be reactivated as soon as they are re-eligible for a tuition waiver. Coordinators will be able to reactivate students by selecting the tenth option from the main screen. *Figure 21* shows the snapshot of the "Reactivation Screen", which contains a list of all the deactivated students.

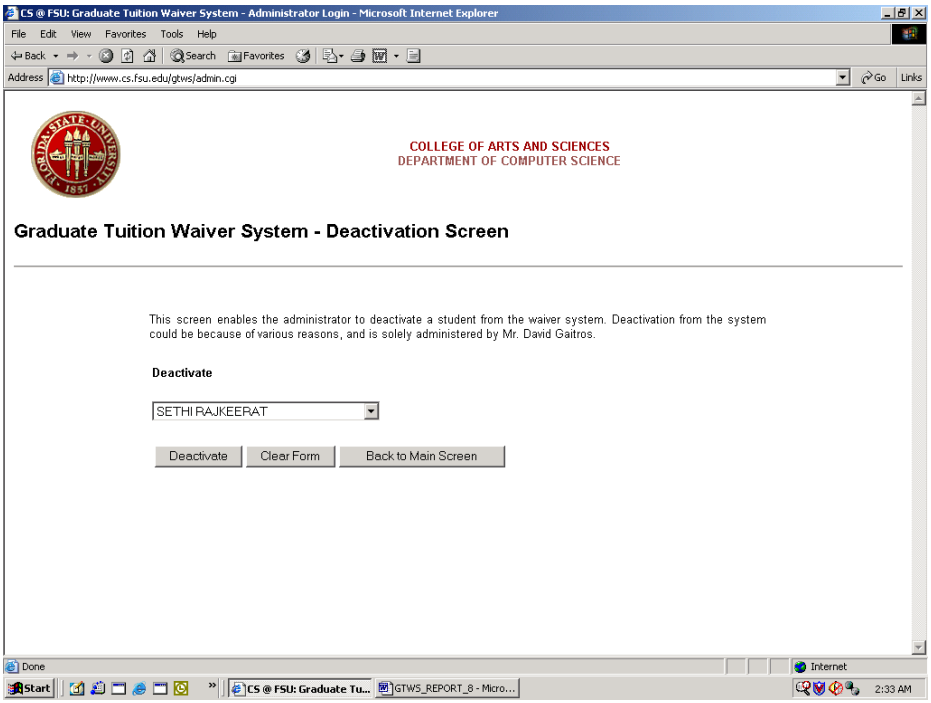


Fig 20: Deactivation Screen of the Administrator Portal

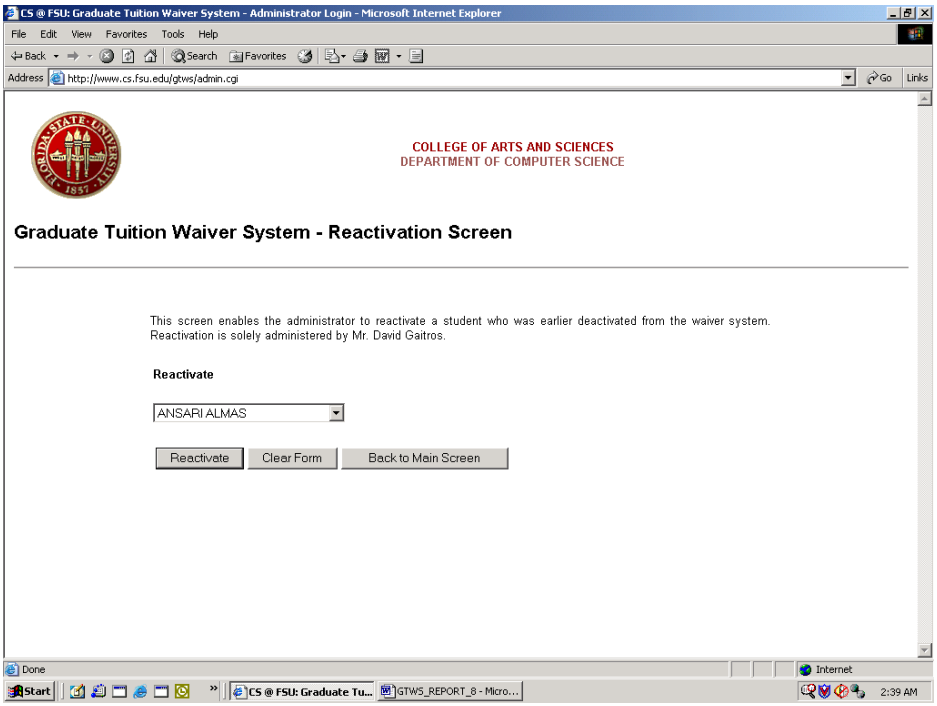


Fig 21: Reactivation Screen of the Administrator Portal

7.3.3 Courses Portal

The tuition waiver coordinator can log into the Courses Portal at http://www.cs.fsu.edu/gtws/newcourses.cgi using the given username - password combination [*Fig 22*]. The username – password combination should be a valid entry in the database, failing which an error message is displayed requesting the user to try again using a valid combination. After verifying the identity of the user, the system loads the main screen of the application [*Fig 23*].

Fig 22: Login Screen of the Courses Portal

This portal allows the tuition waiver coordinator / administrator to add / update / delete courses from the set of permitted courses and update the per credit hour matriculation and out of state fees for both graduate and undergraduate courses. The coordinator can add a new course by selecting the first option from the main screen. Courses could be of two types – variable credit hour courses and fixed credit hour courses. *Figure 24* Appendix E shows the snapshot of a course being added as a variable credit hour course. *Figure 25* shows the snapshot of a course being added as a fixed credit hour course.

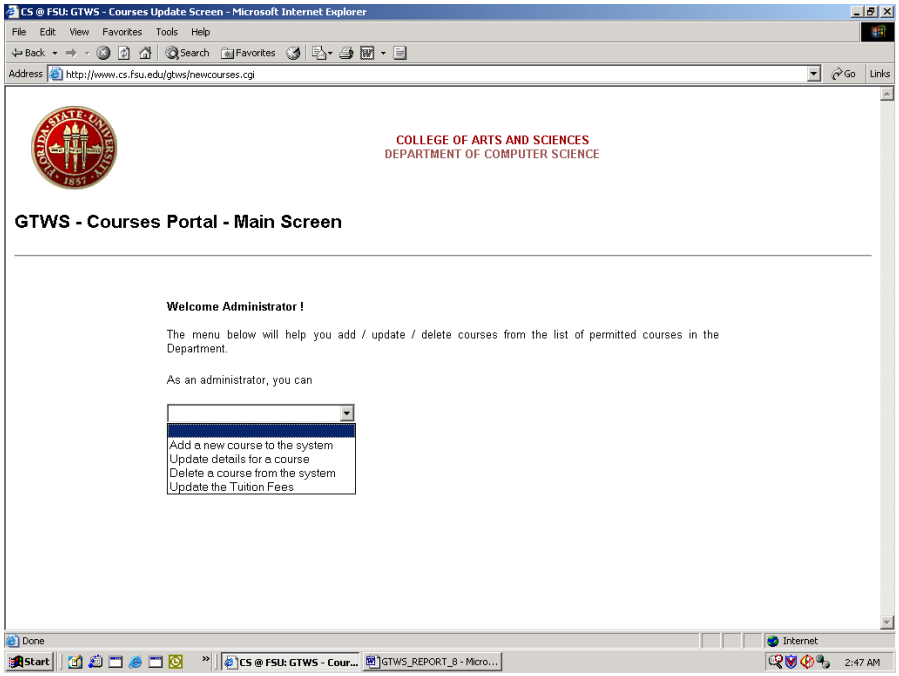


Fig 23: Main Screen of the Courses Portal

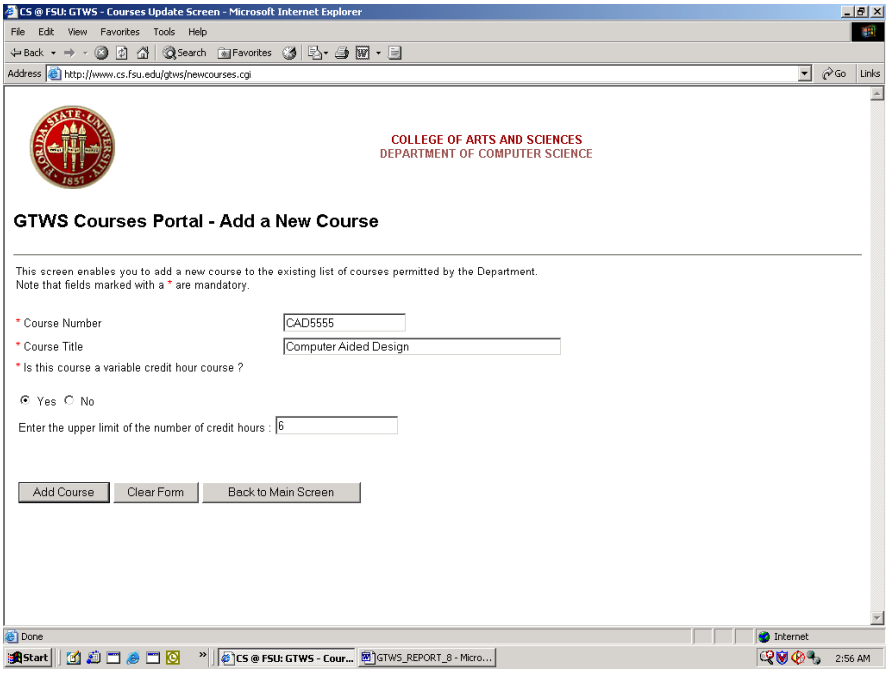


Fig 24: Add a New Course – Variable Credit Hour Course Screen of the Courses Portal

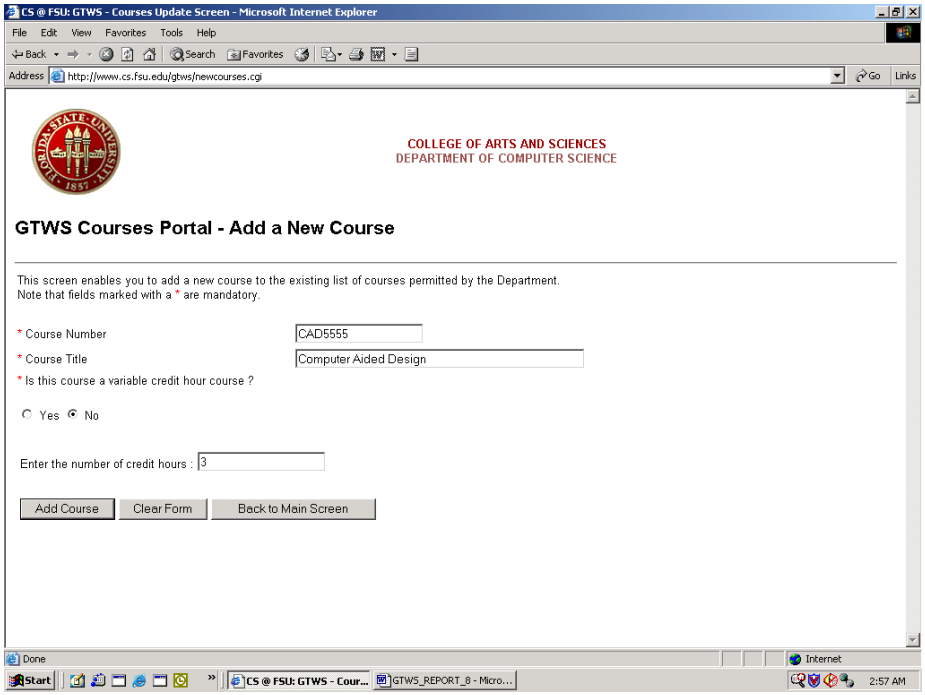


Fig 25: Add a New Course – Fixed Credit Hour Course Screen of the Courses Portal

The coordinator / administrator should be able to update the details of a course. This is possible by selecting the second option from the main screen. The coordinator will be able to select the course to be modified from the list of permitted courses [*Figures 26, 27*]. Courses no longer being offered or which no longer are required for the successful completion of the 32 credit hours of the MS degree in Computer Science need to be deleted from the set of permitted courses. This is possible by selecting the course to be deleted from the list of active courses [*Figure 28*].

A final feature of the courses portal is to provide an interface to update the per credit hour matriculation and out of state fees for both graduate and undergraduate courses. By selecting the fourth option in the Courses Portal, the system displays the current values for the matriculation and out of state fees for undergraduate and graduate level courses [*Figure 29*]. The coordinator will be able to update these values as required, and this would automatically be reflected in the waiver summary calculations.

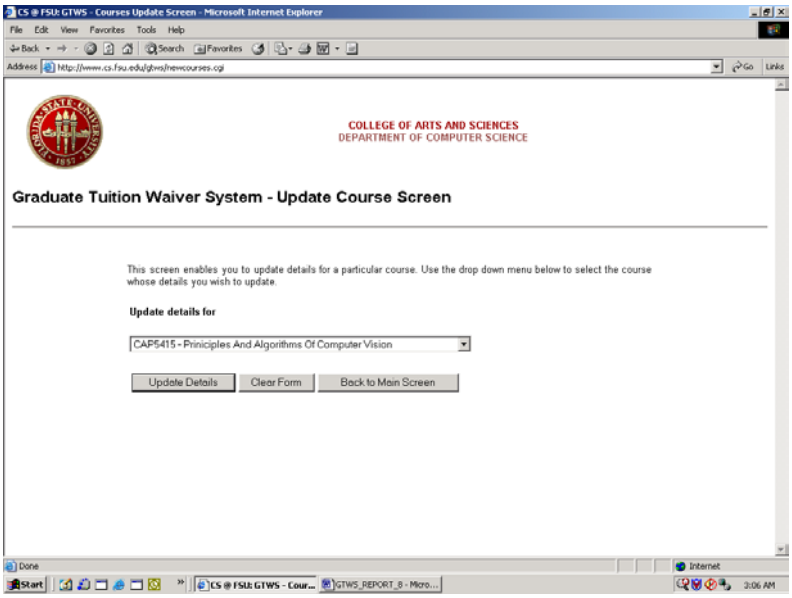


Fig 26: Update Course Main Screen of the Courses Portal

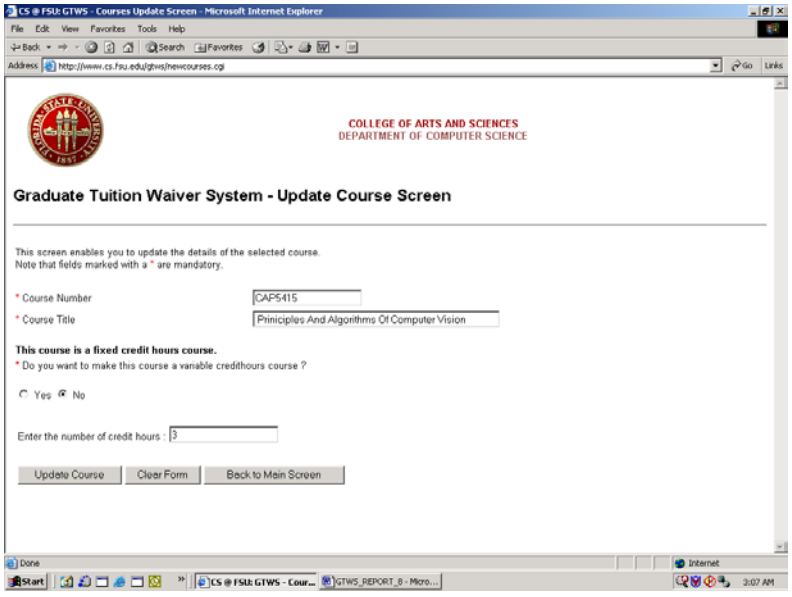


Fig 27: Update Course Screen of the Courses Portal

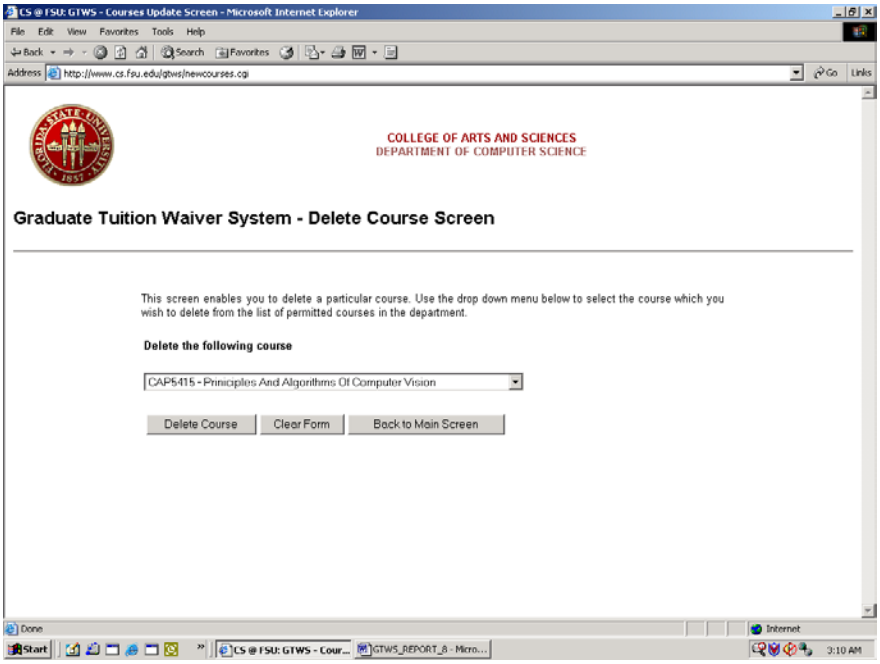


Fig 28: Delete Course Screen of the Courses Portal

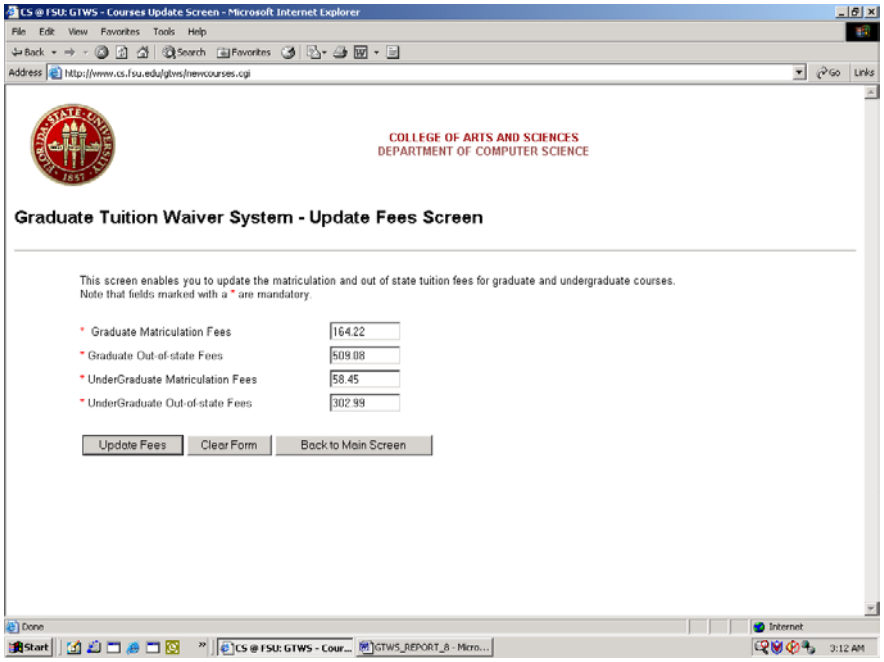


Fig 29: Update Fees Screen of the Courses Portal

CHAPTER 7

Results

The existing system of processing a tuition waiver in the Department of Computer Science was highly paper-centric, resulting in overuse of time, money and other resources. The process was also prone to errors and abuse. All of the above reasons along with the overheads of resource, time and money management strongly motivated the concept and development of an automated system. The proposed Graduate Tuition Waiver System was an automated, Web-enabled system to process and request tuition waivers. This online system was designed to greatly decrease the administrative workload associated with graduate students' tuition waivers.

Both the students and coordinators benefited from the new online system. The students no longer need to stop by Mr. Gaitros' office to drop the completed / revised waiver application. The student can now log onto the new system remotely using any simple web browser and an Internet connection. Any student who is authorized to use the online system can now create, modify or delete a waiver schedule anytime and anywhere, provided the coordinator has granted access to the students for that particular term-year.

There are separate login profiles of eligible students and each profile is different from the other. This ensured security and one student will not be able to access any information about any other student. Earlier students would delay in submitting the completed waiver application form and would tend to turn it in even after the last day. Using the online system the coordinator can now revoke permissions so that students will not be able to log onto the application after the final day. The coordinator can also grant access to the students when he is ready is process the tuition waivers for a particular term-year.

The Graduate Tuition Waiver System has been of immense use to the tuition waiver coordinator of the Department of Computer Science, Mr. David Gaitros. Mr. Gaitros and I decided to test the

application with the teaching assistants only for the Fall 2003 term. The use of the new system resulted in great a savings on paper, time, money and various other resources. The new system was so efficient that Mr. Gaitros allowed the research assistants and fellows to also use the online system. Encouraging results and tremendous saving on various resources now permit the use of the new Graduate Tuition Waiver System for the Spring 2004 and shall be used for every following term.

Mr. Gaitros no longer needs to hold office hours to receive the completed / revised waiver forms from student. The main advantage of this system is that only authorized students can request a waiver. This was of immense help as there have been several cases in the past where students who are not eligible for a tuition waiver have submitted applications. Mr. Gaitros had to manually look at each application and disregard these applications from ineligible students. This was a very laborious and time-consuming task.

Furthermore, students can only request for permitted courses for a waiver. A student is restricted to select from a list pre-approved courses only and this list of courses is the set of courses permitted by the Department of Computer Science that count towards the successful completion of the MS Degree. Mr. Gaitros now has the ability to add, edit or remove courses from this list. This has been of great help, as students cannot sign up for courses that are not permitted for a waiver by the department. Mr. Gaitros had to manually check for these criteria earlier and intimate the student in case of an error.

The new online system has reduced the number of errors, intentional and unintentional, drastically. The system now performs checks at various stages, not allowing the student to proceed unless the validations are performed. This eliminates the scope of error, making the task of the coordinator a lot easier. This ultimately helps in fast processing of the tuition waivers with less botheration to the waiver coordinator.

Mr. Gaitros is now able to automatically allot unique waiver numbers to each student after he obtains the list of waiver numbers for the department from Jon Bridges. The system ensures that no two students are allotted the same waiver number, which was possible in the earlier manual paper-based system.

The Graduate Tuition Waiver System has served as an excellent tuition funds management tool. Mr. Gaitros was able to pull up accurate waiver summaries at various points of time in the semester to calculate the amount of money spent on tuition waivers. The waiver summary screens for the selected term-year give detailed information about the eligible students, their appointment funding, occupation code, waiver numbers, total number of credit hours enrolled, the matriculation fee and the out of state fee, as well as the total amount spent in fees for all the currently active students.

Waiver receipts can be printed out for every student for a given term-year with all the necessary information. The coordinator now has the ability to deactivate a student once he/she graduates, or does not meet the minimum requirements for a graduate tuition waiver. Deactivated students will no longer have access to the online waiver system.

CHAPTER 8

Conclusions

The Graduate Tuition Waiver System is a successful automation of the tuition waiver process, drastically decreasing the administrative workload for the waiver coordinator. Automation was possible because the entire tuition waiver process was well defined. There were clear algorithms defined for each step in the process. Each step in the process could be implemented as an autonomous process in the new automated, web-enabled system. The new system was tested with the Department of Computer Science at Florida State University and it was observed that the new system proved to be a great success and there are several advantages of the new system.

There is still more work which can be done to make this system function across various disciplines. A change in the database design will permit this application to be used by any college in the university. Different levels of permissions can be set – department level, college level and university level. The database to support such a design would be an all-encompassing database, which will contain information of all the students eligible for a tuition waiver in the university and information about the courses that are permitted by the various departments.

The passwords are stored in plain text in the existing design. The passwords can be stored in a hashed format for security reasons. Another task for the future implementation would be to automatically import the student's schedule directly from the registrar's database. By doing so, we could totally eliminate the student portal, thereby eliminating all errors possible from the student. The student will not have to go online to two different websites to create his schedule. The system will be able to automatically import the schedule and the coordinator will be able to remove or edit the schedule, if required. A group of students who signed up for a section of CEN4012 (Software Engineering) are currently expanding the system for university wide implementation.

REFERENCES

1. http://www.fsu.edu/gradstudies/finances/waivers.shtml

2. http://www.research.fsu.edu/contractsgrants/waiverguide.html

3. Tim Boerner's Graduate Tuition Waiver System Documentation; Spring 2002

4. Graduate Tuition Waiver System Specification; CEN 4010 Fall 2003

Appendix A

Current Paper Based System For Requesting A Waiver

Waiver Course Schedule (Form 1)
Fall 2003

_____ _____
First Name Initial Last (Family) Name *Social Security Number

In-State ____
Out-of-State ____

Teaching Assistant (M9182) ____
Grader/Recitation TA (W9185) ____
Research Assistant (M9182) ____
System (Z9185) ____
Fellowship (Fellow) ____

Local Phone # _____ E-Mail: _____

Course Number	Credit Hours	Course Name

*NOTE: Social Security Number must match your student ID.

I hereby attest the above classes constitute my schedule for the upcoming semester and that I am eligible for tuition waivers. I understand that certain fees remain my responsibility and must be paid by myself. If I modify my schedule in any way, I am responsible for giving written notification to the department no later then one day after I change my schedule. Should I fail to do so, waivers will not be entered, or, once entered, cancelled. I will then be responsible for all tuition costs. If I am receiving financial aid, I understand that I have an obligation to take a copy of this form to financial aid distribution.

_____ _____
Signature Date

Appendix B

Waiver Receipt In The Current System

FLORIDA STATE UNIVERSITY
WAIVER RECEIPT 2002-2003

Student
Name_____
__ SSN_____

Term/Year__Summer/03_____ Dept. Computer Science Occ. Code:
_____ or Fellow _____

Univ. Division Acad. Affs. _____Stu. Affs. _____Fin. & Adm
._____ Research _____ Univ. Rel. _____

Matriculation: Hours Covered: _____ Waiver
#:_____ Amount $_____

Out of State: Hours Covered:_____ Waiver #:
_____ Amount $ _____

ELIGIBILITY AND GENERAL INFORMATION

1. Waivers can be given to graduate assistants (occupation codes M9182, M9184, M9185, Z9185) and fellowship holders only. The following stipends apply for the fall and spring terms.

Division of Time	Teaching Asst. Credit Hrs. Taught	Research/Graduate Asst. Hours Worked Per Week	Minimum Term Stipend
1/4	1-3	10	$1500
1/3	4-5	13	$1980
1/2	6-8	20	$3000
3/4	9-12	30	$4500

2. Fall and Spring Graduate Assistants must earn at least $1500per term and at least $7.69 per hour to qualify for waivers. Non-Duty Fellows must receive at least $3150 for fall term and $3150 for spring term through FSU. Summer requirements should be verified with the graduate department.

3. Although a 19 week appointment is preferred, a minimum of 15 weeks is required for the fall and spring terms. The minimum appointment must be at least 25% FTE or greater. Check with your department on summer requirements.

4. The required academic load for a graduate assistant is nine (9) hours for the A term or any combination of terms. Fellows are required to carry twelve (12) hours. Exceptions must be approved by the Dean of Graduate Studies.

5. Waivers can cover only courses related to the student's academic degree. Waivers cannot be used for Sponsored Institute courses through CPD.

6. Special and provisional students are not eligible for assistantships or waivers.

7. **Waivers are cancelled if the student withdraws from the University, drops below the required academic load, or terminates the assistantship or fellowship. Waivers will be revoked if any University authority terminates the assistantship upon which the waiver is based or cancels the student's enrollment. Waivers will not cover any dropped classes. The student will be responsible for any fees assessed.**

	2002-2003 Matriculation Waivers				2002-20003 Out-of-State Waivers		
	Graduate	Undergraduate	Law		Graduate	Undergraduate	Law
1	147.67	58.45	167.83	1	469.20	302.99	488.73
2	295.34	116.90	335.66	2	938.40	605.98	977.46
3	443.01	175.35	503.49	3	1407.60	908.97	1466.19
4	590.68	233.80	671.32	4	1876.80	1211.96	1954.92
5	738.35	292.25	839.15	5	2346.00	1514.95	2443.65
6	886.02	350.70	1006.98	6	2815.20	1817.94	2932.38
7	1003.69	409.15	1174.81	7	3284.40	2120.93	3421.11
8	1181.36	467.60	1342.64	8	3753.60	2423.92	3909.84
9	1329.03	526.05	1510.47	9	4222.80	2726.91	4398.57
10	1476.70	584.50	1678.30	10	4692.00	3029.90	4887.30
11	1624.37	642.95	1846.13	11	5161.20	3332.89	5376.03
12	1772.04	701.40	2013.96	12	5630.40	3635.88	5864.76

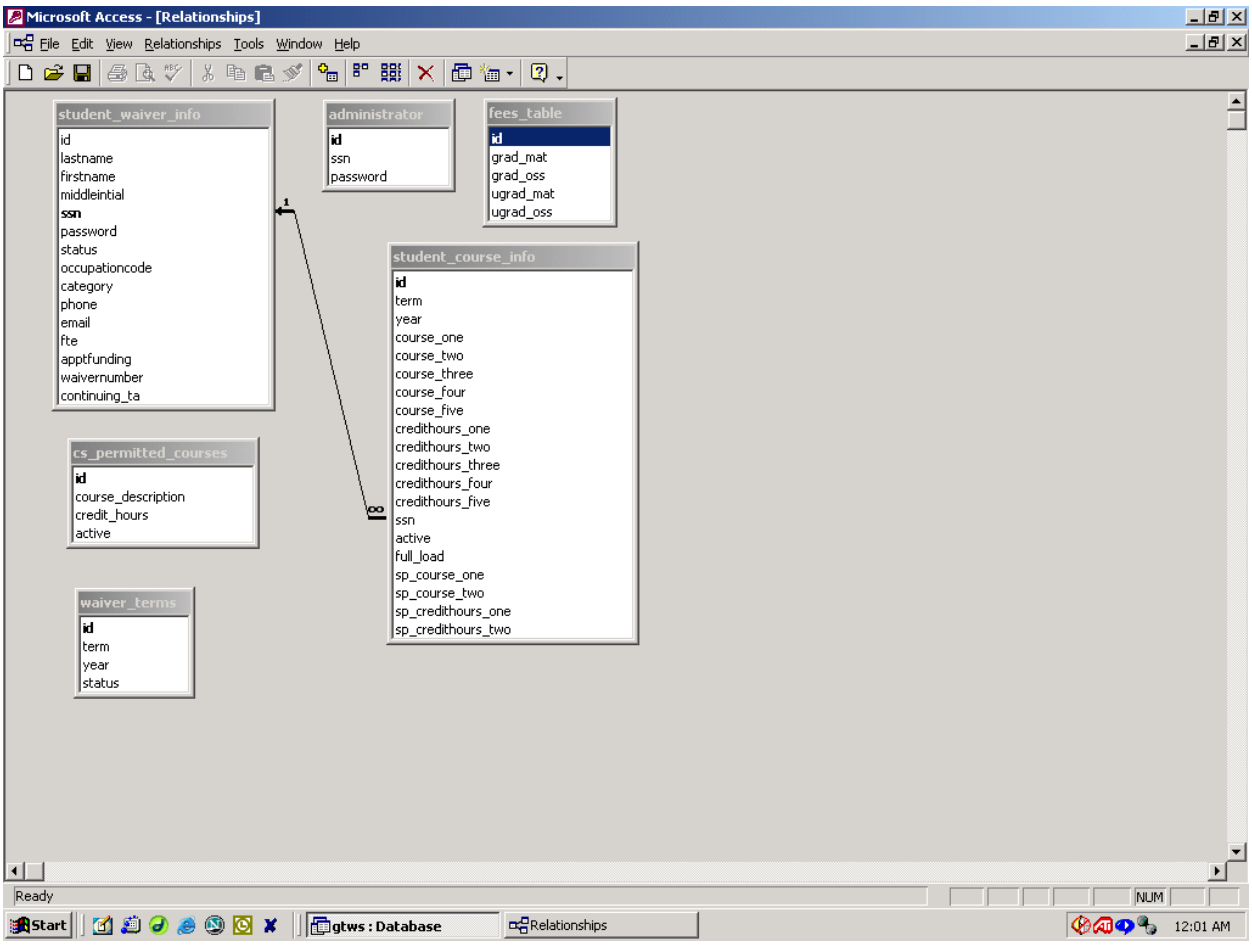
IN-STATE	TOTAL FEES	OUT-OF-STATE
84.58	Undergraduate	402.71
178.26	Graduate	670.92
199.43	Law	712.59
13,508.30	College of Medicine	38,821.20

I have read the above information and understand the waiver policies:

Signature:_____ Date:_____

Appendix C

Database Design



Appendix D

Technical Specifications For The Servers

Web Server Information:

Hardware Configuration: 2x Athlon MP's at 1533 Mhz, 1024 MB RAM
Linux version 2.4.18-27.8.0smp running gcc version 3.2 20020903
Apache Info:
Server version: Apache / 1.3.27(Unix)

Database Server Information:

Hardware Configuration: 2x Pentium III 900Mhz with 900 MB RAM
Linux Version 2.4.20-28.9smp gcc version 3.2.2 20030222
MySQL Ver 12.21 Distribution 4.0.15a, for pc-Linux (i686)

Appendix F

Biographical Sketch

Rajkeerat Singh Sethi was born on October 11, 1978 in Chennai, India. He completed his undergraduate studies in May 2000 and received his Bachelors of Engineering degree in Instrumentation and Control Engineering from the University of Madras at Sathyabama Engineering College in India. He joined the graduate program of Computer Science at Florida State University in Fall 2001. Rajkeerat Singh Sethi graduated from Florida State University in April 2003.