

CS 353

Database Systems  
Spring 2015

**SITS – Student Internship Tracking System**

Final Report

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GROUP-18

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# 1. DESCRIPTION OF THE SYSTEM

Student Internship Tracking System is implemented for the Bilkent University students and to keep track of their internship processes. In our system, there are three user types namely students, department secretaries and advisors. In this system, students can login and see the list of existing companies in the system, see the company quoas and apply for those quotas, see their applications and their results (if the result is positive they can accept or decline this quota) as well as the announcements. When a students find a new company for the internship, they can add this company to the system and wait for the approval for this company. The one who approves these companies is the advisors. They can login to the system, see the self-found companies and approve/disapprove them. Secretaries can open quotas, make announcements and approve applications.

With our system, all processes about internship will be much easier compared to traditional pen and paper works. Students, secretaries and advisors will save from their time and energy with the use of this system in keeping track of internship processes.

# 2. FINAL E/R DIAGRAM

# 3. FINAL TABLES

## 3.1 Faculty

**Relational Model:**

Faculty(facultyName)

**Functional Dependencies:**

No functional dependency.

**Candidate Keys:**

{ (facultyName) }

**Normal Form:**

BCNF

## 3.2 Department

**Relational Model:**

Department(deptName, facultyName)

**Functional Dependencies:**

deptName -> facultyName

**Candidate Keys:**

{ (deptName) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (facultyName) references faculty(facultyName)

## 3.3 Person

**Relational Model:**

Person (userID, name, surname, password, phone, deptName, userType)

**Functional Dependencies:**

userID -> name, surname, password, phone, deptName, userType

**Candidate Keys:**

{ (userID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (deptName) references department(deptName)

## 3.4 Student

**Relational Model:**

Student (userID, cgpa)

**Functional Dependencies:**

userID -> cgpa

**Candidate Keys:**

{ (userID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (userID) references person(userID)

## 3.5 StudentAdvisor

**Relational Model:**

Student (userID)

**Functional Dependencies:**

No functional dependency.

**Candidate Keys:**

{ (userID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (userID) references person(userID)

## 3.6 Secretary

**Relational Model:**

Secretary (userID)

**Functional Dependencies:**

No functional dependency.

**Candidate Keys:**

{ (userID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (userID) references person(userID)

## 3.7 Company

**Relational Model:**

Company (compID, name, password, address, phone, applicableDepts, status, supervisorName, supervisorPhone, city, country, evaluatorRating, studentRating, sector)

**Functional Dependencies:**

compID -> name, password, address, phone, applicableDepts, status, supervisorName, supervisorPhone, city, country, evaluatorRating, studentRating, sector)

**Candidate Keys:**

{ (compID) }

**Normal Form:**

BCNF

## 3.8 RegisteredCompany

**Relational Model:**

RegisteredCompany (compID, registrationDate, studentID)

**Functional Dependencies:**

compID -> registrationDate, studentID

**Candidate Keys:**

{ (compID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (compID) references company(compID)

## 3.9 SelfFoundCompany

**Relational Model:**

SelfFoundCompany (compID, advisorID)

**Functional Dependencies:**

compID -> advisorID

**Candidate Keys:**

{ (compID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (compID) references company(compID)

FOREIGN KEY (advisorID) references studentAdvisor(userID)

## 3.10 Quota

**Relational Model:**

Quota (quotaID, internshipDuration, internshipStartDate, internshipEndDate, availableYears, status, quotaAmount, quotaDeadline,compID, generalAnnouncementID)

**Functional Dependencies:**

quotaID -> internshipDuration, internshipStartDate, internshipEndDate,availableYears, status,

quotaAmount, quotaDeadline, compID, generalAnnouncementID

**Candidate Keys:**

{ (quotaID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (generalAnnouncementID) references generalAnnouncement(announcementID)

FOREIGN KEY (compID) references company(compID)

## 3.11 Opens

**Relational Model:**

Opens(quotaID, compID, deptName)

**Functional Dependencies:**

quotaID -> compID, deptName

**Candidate Keys:**

{ (quotaID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (quotaID) references quota(quotaID)

FOREIGN KEY (compID) references registeredCompany (compID)

FOREIGN KEY (deptName) references department(deptName)

## 3.12 Application

**Relational Model:**

Application (appID, appSubmitDate, approval, appType, secretaryID)

**Functional Dependencies:**

appID ->appSubmitDate, approval, appType, secretaryID

**Candidate Keys:**

{ (appID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (secretaryID) references secretary(userID)

## 3.13 QuotaApply

**Relational Model:**

QuotaApply(appID, quotaID, compID, studentID, drawResult, announced)

**Functional Dependencies:**

appID ->quotaID, compID, studentID, drawResult, announced

**Candidate Keys:**

{ (appID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (appID) references application(appID)

FOREIGN KEY (quotaID) references quota(quotaID)

FOREIGN KEY (compID) references registeredCompany(compID)

FOREIGN KEY (studentID) references student(userID)

## 3.14 DirectApply

**Relational Model:**

DirectApply(appID, compID, studentID, internshipStartDate, internshipEndDate)

**Functional Dependencies:**

appID -> compID, studentID,internshipStartDate, internshipEndDate

**Candidate Keys:**

{ (appID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (appID) references application (appID)

FOREIGN KEY (compID) references registeredCompany (compID)

FOREIGN KEY (studentID) references student (userID)

## 3.15 Announcement

**Relational Model:**

Announcement(announcementID, date, announcementType)

**Functional Dependencies:**

announcementID -> date, announcementType

**Candidate Keys:**

{ (announcementID) }

**Normal Form:**

BCNF

## 3.16 AppFeedbackAnnouncement

**Relational Model:**

AppFeedbackAnnouncement(announcementID, studentApproval, deadline, studentID, secretaryID,appID)

**Functional Dependencies:**

announcementID -> studentApproval, deadline, studentID, secretaryID, appID

**Candidate Keys:**

{ (announcementID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (announcementID) references announcement (announcementID)

FOREIGN KEY (secretaryID) references secretary(userID)

FOREIGN KEY (studentID) references student(userID)

## 3.17 GeneralAnnouncement

**Relational Model:**

GeneralAnnouncement(announcementID, title, message, secretaryID)

**Functional Dependencies:**

announcementID -> title, message, secretaryID

**Candidate Keys:**

{ (announcementID) }

**Normal Form:**

BCNF

**Foreign Keys:**

FOREIGN KEY (announcementID) references announcement(announcementID)

FOREIGN KEY (secretaryID) references secretary(userID)

# 4. FUNCTIONAL DEPENDENCIES AND NORMALIZATION

As it can be seen from previous section, all of our functional dependencies include left hand side as candidate key which is also superkey. As a consequent of this, all of our tables are in Boyce-Codd Normal Form and no decomposition is required.

# 5. FUNCTIONAL COMPONENTS

## 5.1 Use Cases

As indicated earlier in this report, Student Internship Tracking System has four different types of users namely students , secretaries, company staff and advisors(internship coordinators of department. In this section, specific features of the program according to user types will be specified using use case diagrams.

**Student:**

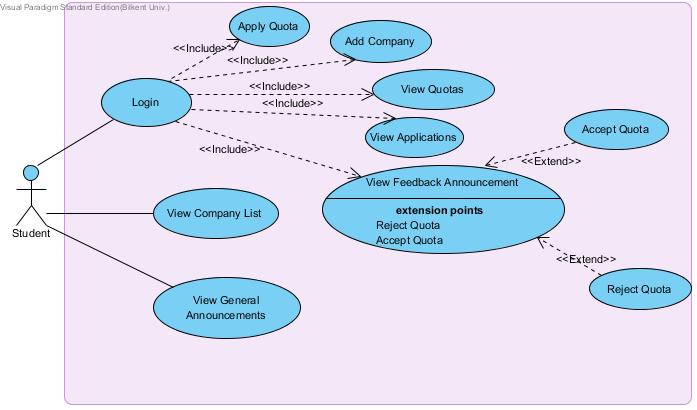
****

Figure -Use Case Diagram for Student

* Students have to login to the system for use cases specified with <<include>>.
* All students can view company list and general announcements from faculty and departments about internship processes regardless of their login operation.
* Students can view quotas of companies.
* Students can apply an existing company's quotas.
* Students can add their own internship company if it does not exist in the company list.
* Students can view their own applications.
* Students can view feedback announcements which are to specify status of their applications.
* After they view feedback announcements, students can accept or reject the quota of a specific company if they are approved. (Specified with <<extends>> in use case diagram).

**Secretary:**

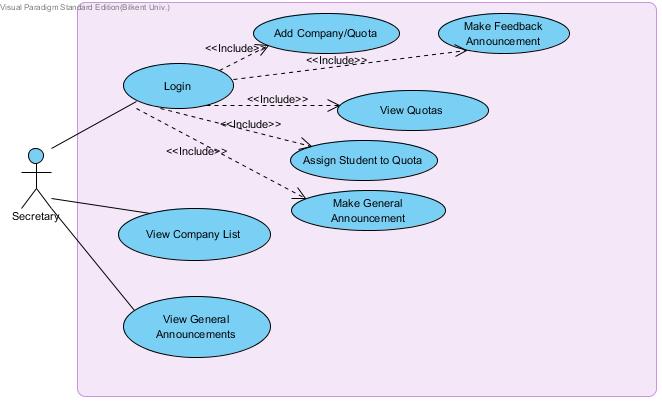
****

Figure -Use Case for Secretary

* Secretaries have to login to the system for use cases specified with <<include>>.
* All secretaries can view company list and general announcements from faculty and departments about internship processes regardless of their login operation.
* Secretaries can view quotas of companies.
* Secretaries can add company/quota pairs to the list.
* Secretaries can make feedback announcement which shows result of students' applications.
* Secretaries can make general announcements which can be seen from everybody regardless of login operation.
* Secretaries can see "open" quota and assign it to other students if the quota is rejected by a student.

**Advisor:**

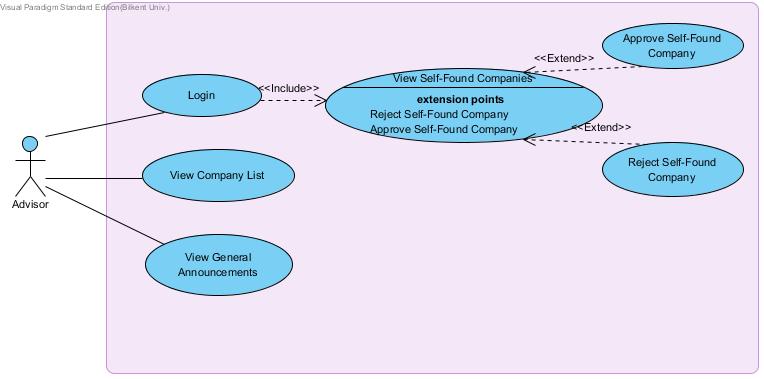


Figure -Use Case for Advisor

* Advisors who are internship coordinators of the department also have to login to the system for use cases specified with <<include>>.
* Advisors can also view company list and general announcements from faculty and departments about internship processes regardless of their login operation.
* Advisors can view self-found companies which are not existing in company list but added by students.
* Advisors can approve or reject self-found company that they viewed.

## 5.2 Scenarios

In this section, some of the most important scenarios for the Student Internship Tracking System will be specified.

**Scenario 1**

**Scenario Name:** QUOTA APPLY

**Participating Actor**: Student

**Flow of Events:**

1. Student has to login into system by using user id and password.

2. Student will click on "Companies" tab.

3. Student will see the list of existing companies and quotas.

4. By clicking apply button next to any specific company, s/he will apply the quota and will wait for result of this application.

**Scenario 2**

**Scenario Name:** ADD SELF-FOUND COMPANY

**Participating Actor:** Student

**Flow of Events:**

1. Student has to login into system by using user id and password.

2. Student will click on "Companies" tab.

3. Student will see the list of existing companies and quotas.

4. In this screen, student will click on "Add Company" button and enter information about self-found company (Company Information, address, phone and website).

5. After specification of company, student will click on "add" button and will wait for approval of this company from advisor(internship coordinator).

**Scenario 3**

**Scenario Name:** ADD COMPANY/QUOTA

**Participating Actor:** Secretary

**Flow of Events:**

1. Secretary has to login into system by using user id and password.

2. Secretary will click on "Companies" tab.

3. Secretary will see the list of existing companies and quotas.

4. In this screen, secretary will click on "Add Company/Quota" button and enter information about company (Company Information, address, phone and website as well as quota information including deadline or max number of students that will be able to apply).

5. After specification of company, secretary will click on "add" button and this company with specified quota will be added to existing company list.

**Scenario 4**

**Scenario Name:** VIEW COMPANY QUOTA

**Participating Actor:** Student

**Flow of Events:**

1. Student has to login into system by using user id and password.

2. Student will click on "Quotas" tab.

3. Student can see companies and their quota status in this screen.

**Scenario 5**

**Scenario Name:** APPROVE/REJECT SELF-FOUND COMPANIES

**Participating Actor**: Advisor (Internship Coordinator)

**Flow of Events:**

1. Advisor has to login into system by using user id and password.

2. Advisor will click on "Companies" tab.

3. Advisor will select "Self-Found Companies" and click on "Filter" to see self-found companies only.

4. In the filtered list of "Self-Found Companies", advisor will click on either approve or reject buttons which are next to company name.

# 6. ADVANCED DATABASE COMPONENTS

## 6.1 Reports

### 6.1.1 Total Number Of Registered and Self-Found Companies

WITH self\_found\_companies (comp\_id, comp\_name, numberCompanies)

AS (SELECT count(compID)

FROM Company

WHERE status = "not approved"),

WITH registered\_companies (comp\_id, comp\_name, numberCompanies)

AS (SELECT count(compID)

FROM Company

WHERE status = " approved")

SELECT S.numberCompanies, R.numberCompanies

FROM self\_found\_companies S, registered\_companies R;

### 6.1.2 Total Number of Applications

SELECT count(\*)

FROM Application;

### 6.1.3 Total Number of Approved Applications

SELECT count(appID)

FROM Application

WHERE approval = "approved";

## 6.2 Views

### 6.2.1 Secretary-Quota View

A secretary cannot view any quota which is not from his/her department (thus, cannot approve or reject these quotas). Therefore, we will use a view for this operation and use secretary id to get department:

WITH

SELECT quotaID, count(\*) AS allApplications (quotaID, count)

FROM quotaApply

GROUP BY quotaID

CREATE VIEW secretary\_quotas\_view AS

SELECT name, city, quotaDeadline, internshipStartDate, internshipEndDate, quotaAmount - count, quotaAmount, status, availableYears

FROM allApplications

WHERE deptName = @deptName;

### 6.2.2 Secretary-FilteredQuota View

This view is same as the previous one except it uses filtering operation:

WITH

SELECT quotaID, count(\*) AS allApplications (quotaID, count)

FROM quotaApply

GROUP BY quotaID

CREATE VIEW secretary\_filteredQuota\_view AS

SELECT name, city, quotaDeadline, internshipStartDate, internshipEndDate, quotaAmount - count, quotaAmount, status, availableYears

FROM allApplications NATURAL JOIN quota NATURAL JOIN opens NATURAL JOIN company

WHERE city = @city AND deptName = @deptName;

### 6.2.3 Student-Feedback Announcement View

A student cannot view any application feedback announcement which doesn't belong to them(doesn't include result of his/her application). Therefore, we will use a view for this operation and use student id to get correct feedback announcement:

CREATE VIEW student\_feedbackAnnouncement\_view AS

SELECT studentApproval, deadline

FROM AppFeedbackAnnouncement

WHERE studentID = @studentID;

## 6.3 Triggers

* When an application is added to application table, depending on the type of the application(quota or direct application), we will update and add this application to the corresponding tables by using trigger. This trigger is implemented as:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`newApplication` AFTER INSERT ON project.application FOR EACH ROW

IF NEW.appType = "directApply" THEN

INSERT INTO directApply VALUES (NEW.appID, null, null, null, null);

ELSE

INSERT INTO quotaApply VALUES (NEW.appID, null, null, null, **0**, **0**);

END IF;

* If a student cancels an application, it is deleted from Application table and it means it should be also deleted from directApply or quotaApply tables. This process will be managed by a trigger. This trigger is implemented as:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`delete\_application` BEFORE DELETE ON project.application FOR EACH ROW

BEGIN

IF OLD.appType = "directApply" THEN

DELETE FROM directApply WHERE appID = OLD.appID;

ELSE

DELETE FROM quotaApply WHERE appID = OLD.appID;

END IF;

END;

* If a student, secretary or advisor is added to Person table, it should be also added to the corresponding table(student, advisor or secretary table) which again will be managed by a trigger. This trigger is implemented as:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`add\_person` AFTER INSERT ON project.person FOR EACH ROW

BEGIN

IF NEW.userType = "student" THEN

INSERT INTO student VALUES (NEW.userID, null);

ELSEIF NEW.userType = "secretary" THEN

INSERT INTO secretary VALUES (NEW.userID);

ELSEIF NEW.userType = "advisor" THEN

INSERT INTO studentAdvisor VALUES (NEW.userID);

END IF;

END;

* When a self-found company is approved, it should be added to registeredCompany table with a trigger (if it is a self-found company, its’ status will be “not approved” initially). This trigger is implemented as:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`advisor\_approval` AFTER UPDATE ON project.company FOR EACH ROW

BEGIN

IF

NEW.status = "approved" AND OLD.status = "not approved" THEN

INSERT INTO registeredCompany VALUES (OLD.compID,DEFAULT);

END IF;

END;

* If a tuple is deleted from Person table, and it is existing in subclasses(sub-tables of Person) it should be deleted from them also. This trigger is implemented as:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`delete person` BEFORE DELETE ON project.person FOR EACH ROW

BEGIN

IF OLD.userType = "student" THEN

DELETE FROM student WHERE userID = OLD.userID;

ELSEIF OLD.userType = "secretary" THEN

DELETE FROM secretary WHERE userID = OLD.userID;

ELSEIF OLD.userType = "advisor" THEN

DELETE FROM studentAdvisor WHERE userID = OLD.userID;

END IF;

END;

* If a draw result for a quota application is affirmative, the status of the quota should be "waiting for student approval". This process is implemented as trigger with the following code:

CREATE DEFINER=`root`@`localhost` TRIGGER `project`.`after\_draw` AFTER UPDATE ON project.quotaApply FOR EACH ROW

BEGIN

IF OLD.drawResult = **0** AND NEW.drawResult = **1** THEN

UPDATE quota SET status = "waiting for student approval"

WHERE quotaID = OLD.quotaID;

END IF;

END;

## 6.4 Constraints

* Student Internship Tracking System cannot be used without login operation except open services (View Company List and General Announcements).
* Status of any company cannot be null since it indicates whether the company is registered or self-found (waiting for approval).
* Password of any user cannot be less than 6 characters and more than 12 characters.
* Internship end date cannot be earlier than its start date.
* Student who make a quota application cannot make direct application and should cancel the quota application to make direct application (other way around is also not applicable).
* Available years of a quota cannot include years less than 1 and more than 3.
* Duration of any internship must be bigger than 20 weekdays.
* Students cannot apply to quotas which are not applicable for their department.
* Students cannot apply to quotas if deadline is passed.
* Secretaries cannot see applications of departments other than their own department.
* If the deadline of a quota application is not passed, secretaries cannot make feedback announcements for these applications (cannot announce result before the deadline).

## 6.5 Stored Procedures

* Our company list page is available for anyone regardless of their login operation. Thus, we plan to use stored procedure to get all companies.
* When a student, secretary or advisor is added we should check if they exist in Person table and if not we should first add them to the Person table. This process is same for all insertion into these tables and because of this; we will use a stored procedure.
* Similarly, when a registered or self-found company is added it should first added to Company table which will be a stored procedure.
* When a quota is rejected by a student, it will be automatically open quota and this procedure will be a stored procedure.

# 7. IMPLEMENTATION DETAILS

* For this project, MySQL is used for database management and InnoDB is used as a database engine.
* For back-end development, PHP is used.
* For front-end development, HTML and JavaScript are used and the appearance of the page is arranged with CSS.
* We created our tables from MySQL shell. However, changing columns of tables using TOAD is much easier. Therefore, for further development and arranging columns, we used TOAD for MySQL.
* In Student-Internship Tracking System, any page uses following code to connect database:

// Variables

$servername = "localhost";

$username = "root";

$password = "comodo365";

$dbname = "project";

// Create connection

$conn = mysqli\_connect($servername, $username, $password, $dbname);

// Check connection

if (!$conn) {

die("Connection failed: " . mysqli\_connect\_error());

}

* For creating SQL statements and sending to database, following code is used (as an example, login page is chosen where we get userID and password from database to check):

$query = "SELECT \* FROM person WHERE userID='$usr' AND password='$psw'";

// run the query and store result

$result = mysqli\_query($conn, $ query);

* For enforcing constraints, we used GUI and warnings. For example, any user trying to use "Login" button without entering user id or password will face a warning saying "Please Fill All Required Fields". In addition, GUI is used in a way that position of buttons, list of buttons and views to different users are enforcing constraints. For example, the constraint about open services (any user can see general announcements and list of companies without a login operation) is enforced with two buttons in the same page with login so that any user can click these on without clicking on login. Lastly, we have different GUIs for different user types which also enforces constraints. For example, GUI for student type is chosen in a way that students cannot approve any company, quota etc.(there is no button for that).

# 8. USER MANUAL

**Open Services (for all user types):**

Any user can see announcements and list of companies regardless of login operation. For these services, we have Announcements and Company List buttons shown in Figure 4. Clicking on "Announcements" will result in page in Figure 5 where the general announcements from secretaries shown and clicking on "Company List" will result in Figure 6 where the list of existing (approved) companies for the internship system is shown.

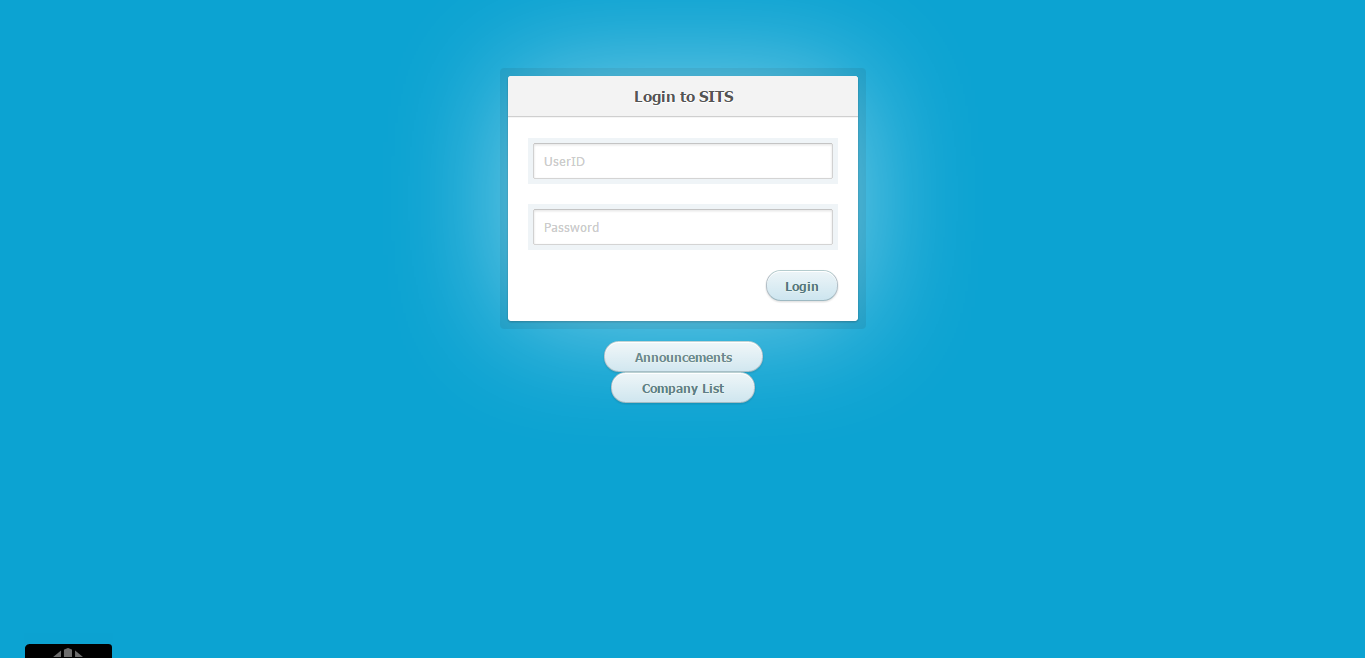


Figure - Login Page

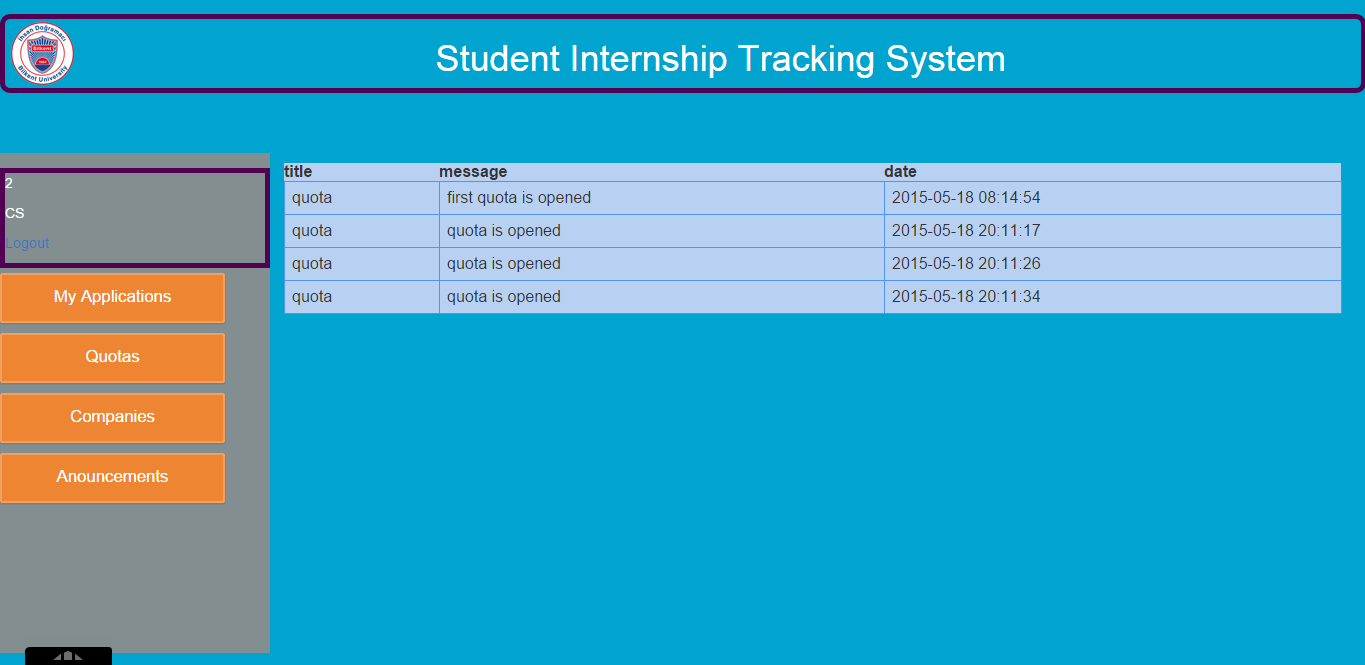


Figure - Announcements Page

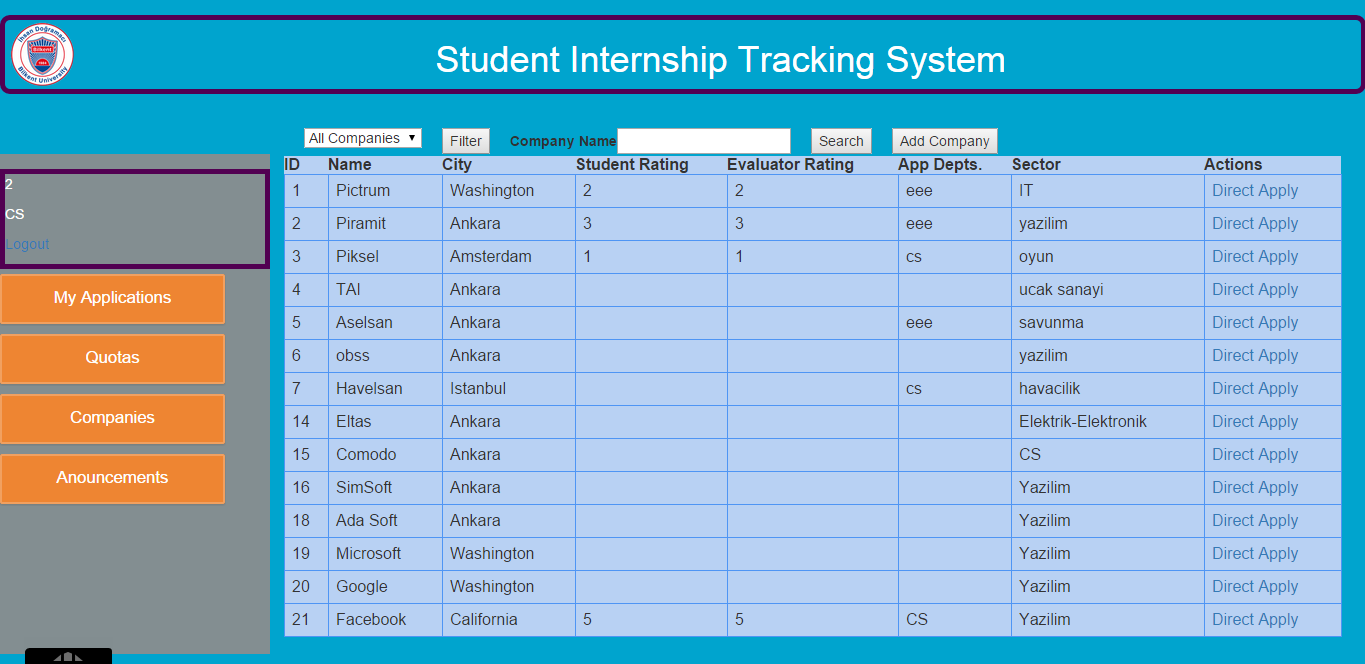


Figure - Company List Page

## 8.1 User Manual for Student

**Login Page:**

The login page for student includes User ID and Password fields for login operation as well as open service buttons ( Announcements and Company List buttons). Login Page is shown in Figure 4. Students can login to the system for further operations using their pre-determined user ID and password. By clicking one of the buttons for open services, they will see the pages previously discussed under **Open Services.**

**Main Page:**

After login operation, students will see the main page showed in Figure 7. In this page, left side shows the id and the department of the student as well as some buttons for further operations namely "My Applications", "Quotas", "Companies" and "Announcements". This page shows the list of companies as default and name, city, evaluator and student rating for that company, applicable departments (App. Depts.) and sectors. Further operations that students can do in this page are listed below:

* Direct Apply to any company by clicking on "Direct Apply" next to each listed company. This operation will result in Figure 8 where the start and end date of the internship should be entered by student. After, clicking on "Apply" button will result in question asking "Drop other applications?" to enforce only one direct application for each student. By admitting, application will be shown under My Applications which will be explained in My Applications section.

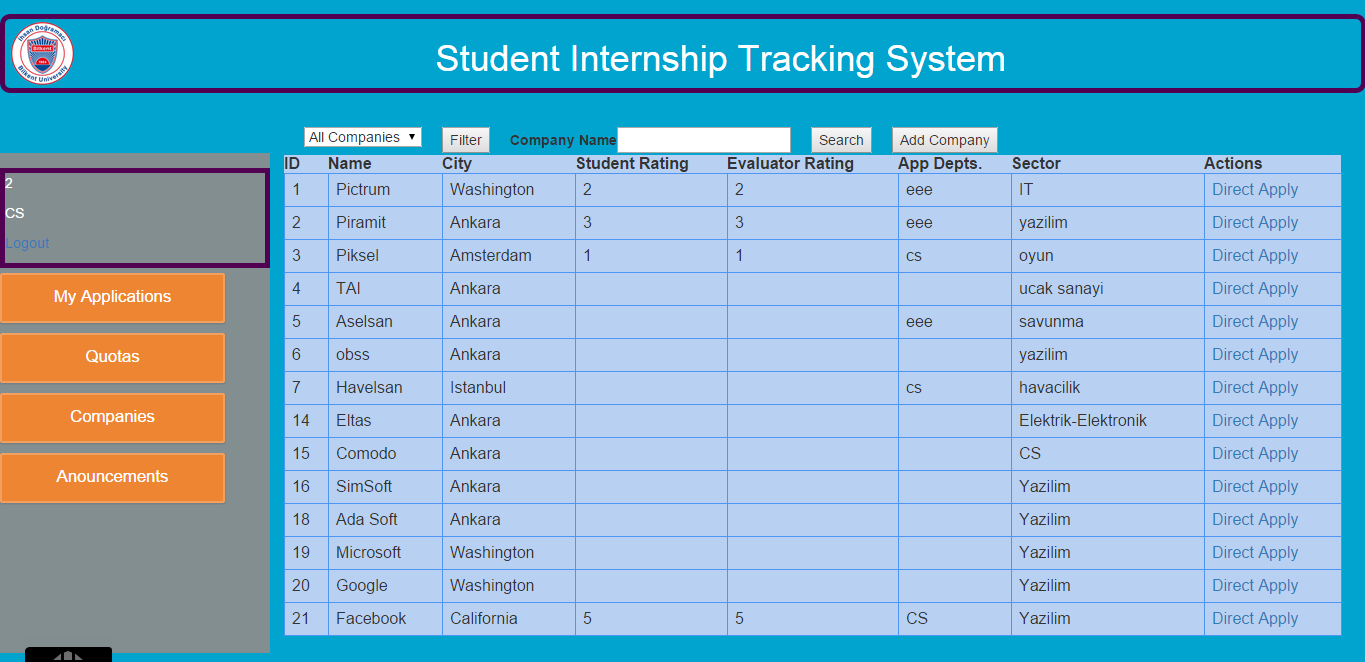


Figure - Main Page for Student

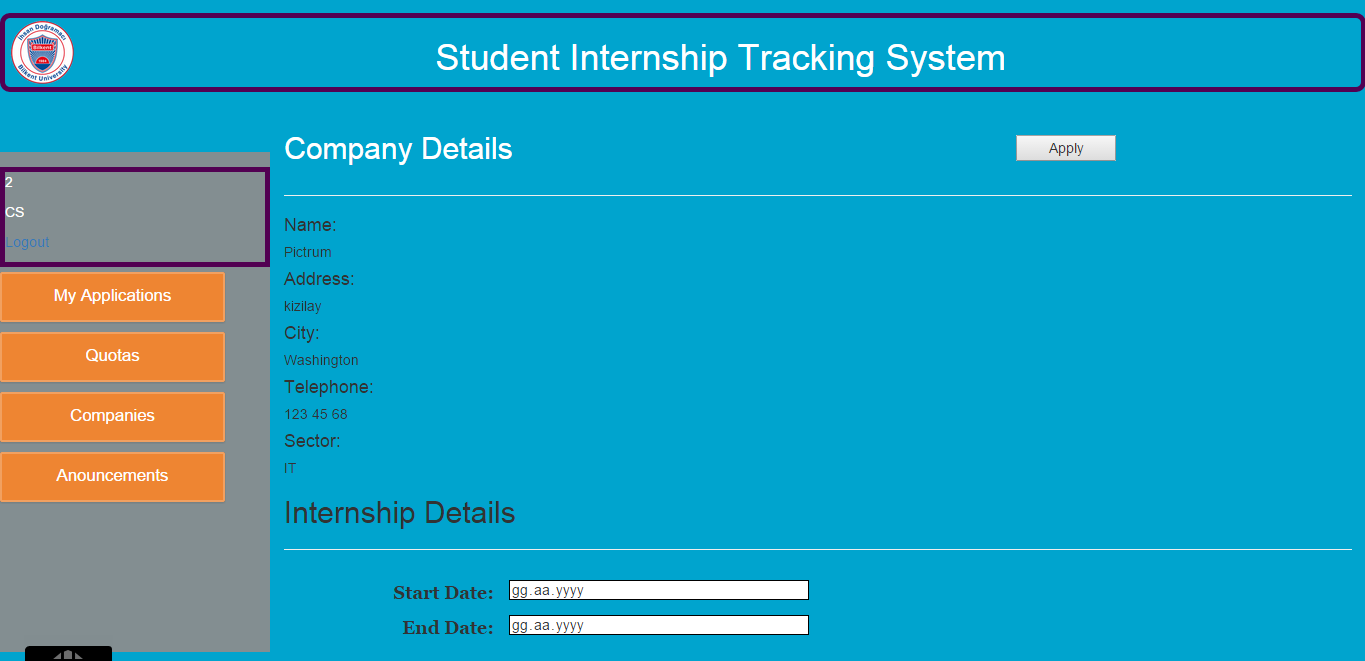


Figure - "Direct Apply" Page

* Students can filter the list of companies using filter option on the top of the page. Selecting any city from dropdown list and clicking on Filter will result in page showing companies in only that city.
* Student can also search for company and see whether it exists in the list or not. For this operation, text field on the top of the main page named with "Company Name" is used and students can type the company name and click on "Search" button for this operation.
* Students can add a new company to the system by using "Add Company" button on top of the page. This button will result page shown in Figure 9 and by filling out the necessary fields, students can add the company.

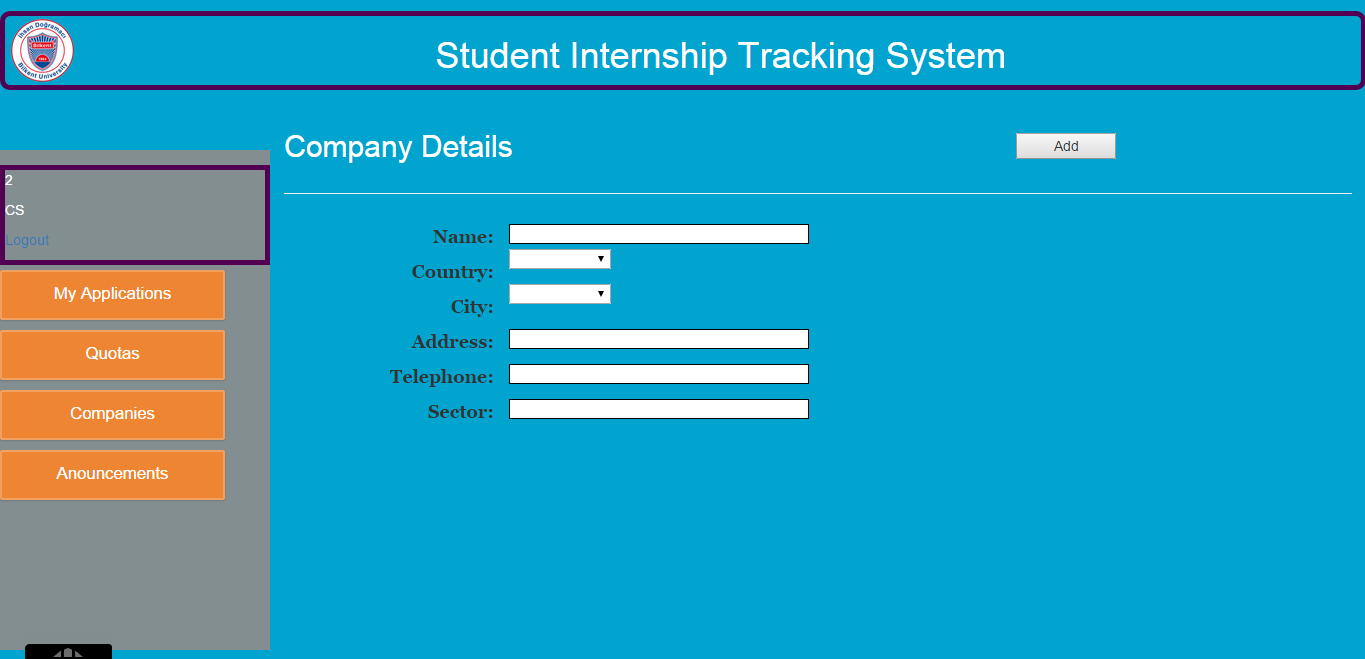


Figure - Add Company Page

**My Applications:**

This page (shown in Figure 10) shows the current applications of the student and students can see this page by clicking on "My Applications" button from any page. In this page, students can see their quota and direct applications as well as training period, total applications, quota amount and status for their applications(feedback announcements). In Figure 10, the corresponding student has one quota and one direct applications. The status for the quota application is "waiting for student approval" which shows the secretary approved the application and student should click on either Yes or No depending on his/her final approval for this internship from Actions tab. If the status is "waiting for drawal", it means there is still time for deadline and quota for the selection. On direct applications, status is either "Not Approved" or "Approved" depending on advisor approval for the new company. For the direct applications, student has opportunity to cancel application using Actions tab(shown in Figure 10).

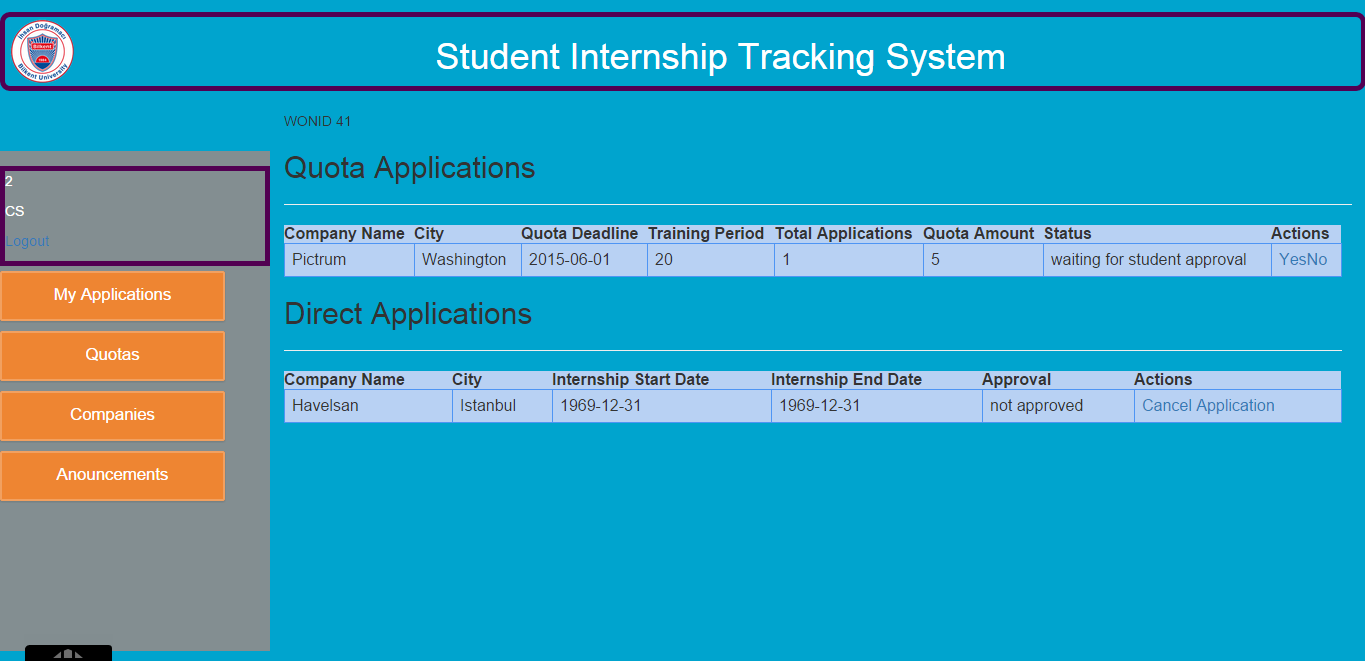


Figure - My Applications Page

**Quotas:**

This page (shown in Figure 11) shows the available quotas for quota applications and students can see this page by clicking on "Quotas" button from any page. In this page, students can see the list of companies, quota deadline, internship start and end dates, total number of applications for that company, quota amount, status and available years. As an example, in Figure 11, company called Pictrum has opened 3 different quotas for different dates and Ada Soft has opened one quota. Student in Figure 11 has one quota application and the status for this application is "waiting for student approval" (mentioned in My Applications section). As this quota application is made by the student, the actions part is Not Applicable(N/A) for this company. For other companies, students can click on "Apply" under Actions.

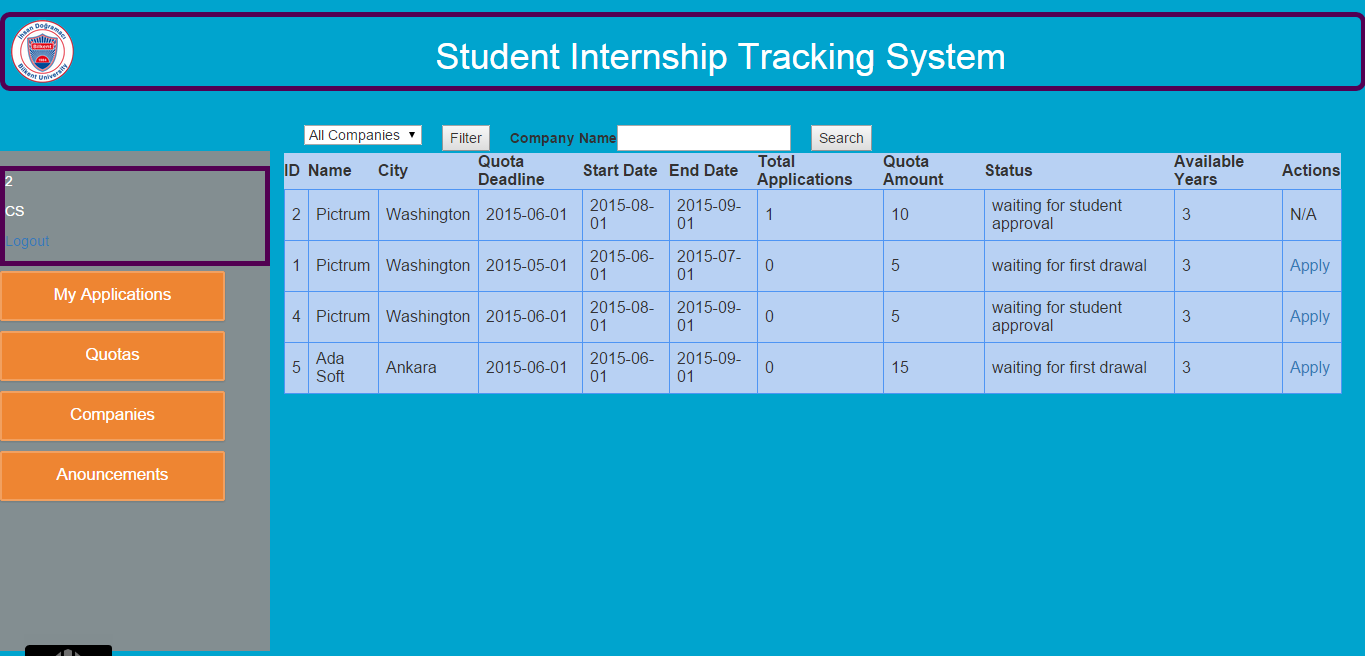


Figure - Quotas Page

**Companies:**

This page is exactly the same as the main page and shows the list of companies (See Figure 7).

**Announcements:**

This page is exactly same as the announcements page under open services (See Figure 5).