



Bilkent University

Department of Computer Engineering

Erasmus Registration Management System

Project short-name: ERSMS (Group Number: 1E)

Analysis Report

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Contents

Erasmus Registration Management System

1 Introduction	3
2 Current System	3
3 Proposed System.....	4
3.1 Overview	4
3.2 Actors	5
3.3 Functional Requirements	6
3.3.1 Sign Up	6
3.3.2 Login	6
3.3.3 Views	7
3.3.4 Auto-Placement of Students	8
3.3.5 To-Do Lists	8
3.3.6 Auto-Assessment of Workload	9
3.3.7 Process Monitoring	9
3.3.8 Messaging	9
3.3.9 General Form, Request and Decision Logging	9
3.3.10 Previously Accepted and Transferred Course Database	9
3.3.11 Social Aspect.....	10
3.4 Non-functional Requirements.....	10
3.4.1 Usability	10
3.4.2 Reliability	10
3.4.3 Security/Safety	10
3.4.4 Performance	11
3.4.5 Maintainability	11
3.5 Pseudo Requirements.....	11
3.5 System Models.....	12
3.5.2 Dynamic Models	30
3.5.3 Object and Class Model	36
3.5.4 User Interface	37
4 Improvement Summary	45
5 References.....	46

Analysis Report

Project short-name: ERSMS

1 Introduction

Our project is an Erasmus application management software that mainly focuses on easing up the jobs of students, coordinators and other stakeholders. To this end, our team aims to remove the paperwork that is currently done and replace it by digitalized documents to speed up the process. Some of these documents are pre-approval forms, syllabuses of the courses given at the host institute for evaluating equivalence for the classes at home universities, and course transfer and exemption forms. Students will be able to send these forms through our app, leaving very little work to-do by hand for the Erasmus coordinators.

The application also contains additional features that will further facilitate the process. Placements of the students to their host universities will be conducted automatically by the system based on their choices. Moreover, the outgoing students will be able to monitor the previously accepted courses at each university, see the information of other students that share the same host university and check their language exam scores if the host university requires one. For the Erasmus coordinators, a to-do list will be created by the system so that they won't miss out anything and can track the process in a more organized way.

From the above required updates, it can be deduced that the current Erasmus application management process is cumbersome and difficult to handle. Especially in the digital era, the use of paperwork is definitely outdated with no benefit to students or coordinators. Therefore, we intend to solve this issue and other problems in the current system by making the entire process online and adding additional features which will be convenient for both parties, coordinators and students.

2 Current System

Our team has attended the presentation given by the stakeholder of this project, Can Alkan. According to that presentation, a great number of tasks are done manually. For example, Erasmus coordinators place the applied students to exchange schools by hand based on a score table supplied by the administrative staff. Besides that, our observations on the basis of Can Alkan's presentation and current exchange program management procedure are the following:

- Selected students are placed manually by the department exchange coordinators (Can Alkan and Aysegül Dündar) according to the score table prepared by the Bilkent University Office of International Students and Exchange Programs.
- Exchange coordinators cannot arrange appointments with outgoing students or directly message those students. Can Alkan mentioned that even a simple button that triggers the email application (i.e., Thunderbird) with the students email address would be beneficial.
- For approving elective courses, exchange coordinators receive the corresponding course's (course that is given by the host institute) syllabus over the email from the outgoing student.
- For must courses, the syllabus of the course given at the host institute is inspected and approved by the corresponding course coordinator at the Bilkent University.

- Previously accepted and transferred courses (given at the host institutes) are held in a spreadsheet.
- In the current system, courses from the exchange schools that were previously evaluated as having an equivalent course in Bilkent University are not logged in a proper manner. Moreover, if the student wants to have the non-equivalent courses taken in the exchange school counted at Bilkent University, he/she needs to get an approval manually by following a particular procedure (as previously mentioned).
- Outgoing students propose the courses that they want to take at the host institute by preparing a pre-approval form by hand while also adding the equivalent courses at the Bilkent University. Students submit this form by hand or by email to the exchange coordinator.
- Even though a pre-approval form is valid and approved by the exchange coordinator, after the exchange period ends and host institute sends the transcript of the students, exchange coordinators again prepare, with the guidance of pre-approval forms and previously accepted course list, and submit a form called “Course Transfer and Exemption Form” to the Faculty Administration Board. This form contains the same course information from the pre-approval form but this time students’ grades are included. Considering those grades and the overall sufficiency of the courses, in addition to exchange coordinator, department chair and the dean signs and approves the courses taken at the exchange school to be counted in Bilkent University.
- Since the current system is completely manual, Erasmus coordinators do not have an automatically generated task guidance mechanism (i.e., “Which job should I complete now?”), also known as “to-do lists”.
- Workload assessment between the exchange coordinators is done manually based on a mutual agreement. For example, Kingston University is assigned to Can Alkan whereas AGH is assigned to Ayşegül Dündar.
- Aforementioned forms are not stored in a database, therefore searching and querying the forms is difficult.
- Students are unaware of the status of their submitted forms and approvals unless the Erasmus coordinators notify them.

3 Proposed System

3.1 Overview

From our team’s perspective, using manual methods in exchange application management is not practical enough to operate such a critical and sensitive subject for students. Moreover, we think that academicians should not spend an excess amount of time and effort dealing with paperwork and errands. Therefore, we propose to create a web application for the benefit of all parties involved in the exchange application process.

Our system will cover the functionalities that are done by hand (mentioned in section 2) and digitalize these functionalities with little to none paperwork. First step of our application is the login and sign up screen. After the login screen, users will be provided with different aspects of the system depending on their roles. For instance, an exchange coordinator will be able to list, query, and approve the submitted forms. Also, they can reach the students’ details such as application information, application status (i.e., approved, canceled), and more. Then, if they desire, they can send messages (or emails) to students and arrange appointments with one click. And most importantly, ERSMS provides some features that will ease the exchange coordinators’ tasks significantly. To start with, ERSMS will allow exchange coordinators to perform

automatic placements of the outgoing students, based on the score table prepared by the administrative staff. Furthermore, exchange coordinators will have a to-do or a task list which will help coordinators to organize and manage the waiting tasks. This to-do list will consist of notifications such as “Student A has uploaded a pre-approval form”, “Instructor B has approved the equivalency for the course X”, or “Student C has canceled their exchange application”. Last but not least, ERSMS will have a workload distribution mechanism to ensure that the work is equally divided between the exchange coordinators. To illustrate, the exchange coordinators will divide the schools among themselves, and to-do lists will be created based on the schools that exchange coordinators are individually responsible for.

On the other hand, if the logged in user is a student, then he/she will be able to use different functionalities. According to that, students will be able to submit all kinds of forms or documents (e.g., pre-approval form, syllabuses) completely digital. They will be able to list the previously accepted equivalent courses. If a course at the exchange school is not listed as equivalent at Bilkent University, students will be able to use ERSMS to fill out a form requesting for equivalence. Moreover, they will be able to keep track of their application and the submitted forms’ status (i.e., approved, pending), including the Faculty Administration Board’s decision. Students will be able to see the to-do list for the tasks that should be done before and after the mobility. Finally, students will be able to send messages to exchange coordinators and arrange appointments with them over this messaging feature.

In summary, ERSMS proposes a web application which offers automated solutions for both exchange coordinators and students during the exchange application process.

3.2 Actors

As a result of the requirements analysis [1], we identified seven different types of actors that can interact with the ERSMS application.

- **ERSMS User:** Base actor type for all other actor types. If a user is not assigned to a specific actor type on sign up or later on, the user will be evaluated as an ERSMS User. If a user only has the ERSMS User actor type, the user has limited access to the system. For example, an ERSMS User can participate in authentication-related use cases or get notifications.
- **Student:** A ERSMS User gets the student role upon the registration process, or a privileged actor (i.e., Admin or Exchange Coordinator) can manually grant this role to users. Students on ERSMS can see their placement results, track their application status, submit pre-approval forms, demand course equivalences, browse previous course equivalence requests and forms, message exchange coordinators and instructors, and more. Finally, Students will be able to see a to-do list of things that should be done before and after the exchange is completed.
- **Exchange Coordinator:** An exchange coordinator can only be registered to the system by an admin. Exchange coordinator can accept or reject pre-approval forms, issue CTE forms, view student profiles, automatically place students to exchange schools according to the score table uploaded by OISEP, and browse through past forms and request decisions for students in their departments. Moreover, they can see and manage their to-do list, which guides

them about the exchange procedure-related tasks. Lastly, they can send messages to other users.

- **Course Coordinator/Instructor:** A course coordinator/instructor can only be registered to the system by an admin. Their primary responsibility is to accept or reject course equivalence requests for their course by students. They can still browse previous course equivalence requests, view student profiles, and message other users.
- **Dean/Department Chair:** A dean/department chair can only be registered to the system by an admin. They can approve or reject CTE Forms issued by the exchange coordinators. They can still browse the decisions for previous forms, view student profiles, and message other users.
- **OISEP:** Their only responsibility is to upload the score table based on departments. They can only be registered to the system by an admin.
- **Admin:** Manages the privileged operations for the ERSMS application. This is a role for the maintainers of the application to take care of a functioning system. For example, they can register new users to the system, and privileged users can only be registered by admins. An integrated admin account comes with the application, and admin accounts can create other admin accounts.

3.3 Functional Requirements

3.3.1 Sign Up

For this kind of an application, it will be appropriate if the login credentials of users are synchronized with the STARS. However, at this point of the development, it is not possible for our team to assume such an integration with another platform. Therefore, ERSMS will have its separate sign up and login system. As it can be understood, the first part of this authentication system is a sign up page. However, for the non-privileged users such as students, this sign up page will only be active after the course coordinators complete the automatic placement procedure. This way, we ensure that irrelevant students will be kept out of the system. In this page, users will be asked to fill in the required information fields such as name, surname, Bilkent University ID Number, Bilkent University email, and password. Before proceeding, if the entered email address is not under Bilkent University domain (bilkent.edu.tr), sign up will be instantly failed. After checking that point, if the given Bilkent University ID Number has a match in our automatic placement logs, a confirmation email will be sent to the entered email address. Following the confirmation sign up process will be completed. On the other hand, privileged accounts such as course coordinator will be created from the administrator account's panel. An initial administrator account is created upon the deployment of the ERSMS. Admin users will be able to register other users to the system.

3.3.2 Login

Login process will begin when the user submits his/her email and password. If there is a valid account with the submitted email the password, technically, the hash of the password, will be checked. If the submitted password is also correct the user will be redirected to a specific view (or page). For instance, if the user has a student role system will redirect him/her to the student page. If a user enters the password or email incorrectly the access will be denied until all login credentials are correctly submitted.

3.3.3 Views

According to the user's role, the user will be authorized to use a specific view. These views will be described in detail (i.e., role specific functions) following this section. Other than that, all users will be able to reach their profiles which include relevant information regardless of their role. Similarly, each user will have a view for messaging with other users.

3.3.3.1 Administrator View

Administrators are the most privileged users in ERSMS in terms of application-side configuration. Therefore, their view on the ERSMS application includes the components for adding, managing, and removing all kinds of users. For the user management, they will be able to edit user profiles, change user roles, they can set application settings such as language and time zone. They will be able to add new roles and edit roles' permissions if necessary. Lastly, they will be able to access detailed information about the system where the ERSMS runs and application logs.

3.3.3.2 Exchange Coordinator View

Exchange Coordinators are greeted with a to-do and notification dashboard which helps coordinators to do their tasks in an organized way. This dashboard is powered by our workload balancing mechanism between the coordinators. Moreover, exchange coordinators will be able to reach components for approving and signing the student submitted pre-approval forms digitally. Also, these forms will be logged to the ERSMS' database and exchange coordinators will be able to search, filter, and list previous forms. Similarly, they will be able to access a panel to put "Course Transfer and Exemption" into action for returning students. Besides that, it has to be mentioned that exchange coordinators have a view for triggering the automatic placement process. On the other hand, exchange coordinators can register, other exchange coordinators, instructors/course coordinators, department chairs/deans, and students to the application. Additionally, exchange coordinators will be able to cancel the placement of the students depending on some conditions such as an unsatisfactory GPA at the Bilkent University school (which will remove the student from the exchange process completely). Lastly, exchange coordinators will be able to arrange appointments with students using the messaging view. This view will also include the previously accepted and transferred courses database and exchange coordinators will be able to manage this database.

3.3.3.3 Course Coordinator/Instructor View

The course coordinators and instructors will be able to see the equivalence requests sent by the students for the courses given at the host institute. These requests will include the syllabus of the course given at the host institute and the course (code or name) given at Bilkent University that will be exempted. If the course coordinator or instructor finds the corresponding course satisfying for transferring the request will be approved, otherwise they will decline the request. This view will also include the previously accepted and transferred courses database and instructors/course coordinators will be able to manage this database.

3.3.3.4 Department Chair/Dean View

Department Chair/Dean view will be limited to the approval of the "Course Transfer and Exemption" forms. Hence, they will have a panel to search, filter, and list previous CTE forms as well as with another view to approve or decline newly submitted

CTE forms. This view will also include the previously accepted and transferred courses database and chairs and deans will be able to manage this database.

3.3.3.5 Student View

Student view will start with a to-do list (based on the forms they need to submit or tasks they need to complete) and a notification dashboard. Students will be able to send equivalence requests for the courses that are not previously accepted or transferred by uploading the syllabus of the course given at the host institute (and the corresponding course code or name at Bilkent University) to the course coordinators and exchange coordinators. Students will also view and edit the details of their account and manage their exchange status (in essence, they will be able to cancel their exchange placements). Moreover, students will also be able to submit a pre-approval form for the courses they are going to take at the host institute. They may also be able to edit the pre-approval forms that are submitted but not yet confirmed by the coordinators. They may also send new pre-approval forms if the previously accepted form has been changed or the previously sent pre-approval form is denied. The status of the forms and requests, the forms that the student is involved in (pre-approval, course transfer form and equivalence request), will be visible by the student. Students will also be able to see the students who are also going to the same school (same host institute) as themselves or the students that previously went to the same school as themselves. Furthermore, students will be able to arrange appointments with the exchange coordinators via the messaging function. Lastly

3.3.3.6 OISEP View

The officials of the OISEP (Office of International Students and Exchange Programs) will be able to upload or delete the score table spreadsheet using this view.

3.3.4 Auto-Placement of Students

Based on the score table spreadsheet uploaded by the OISEP, student replacement will be done automatically by the system. However, only Erasmus coordinators can initiate this action by clicking the "Place Students" button which is only visible to them. When the button is clicked, the placement process starts from the student with the highest score and ends when the bottom of the list is reached. The system will check the choices of the students, and place them if their chosen host school has an available quota. When the quota of the first chosen university is full, the system checks the second choice of the students. The algorithm continues in this fashion and if no university chosen by the student has an available quota, the student is not replaced and is in the waiting list. After the placement process, if a university still has an available quota, Erasmus coordinators can ask the students in the waiting list whether they want to go or not starting from the student with the highest score. Similarly, if another student cancels his/her application, Erasmus coordinators can ask the students if they want to reply to them via email.

3.3.5 To-Do Lists

Both the Erasmus coordinators and the students will have a to-do list available on their pages.

For the coordinators to-do list includes:

- Approving a pre-approval form
- Approving an equivalent course given in the host school. (After the student sent the syllabus and got an affirmative answer from the instructor of that course.)

- Approving a course transfer form sent by the host university.
- Notification when a student canceled his/her application.

For the students:

- Send a pre-approval form for the courses that will be taken in the host university.
- Send the syllabus of the equivalent course in the host university (This is optional).

3.3.6 Auto-Assessment of Workload

The workload should be balanced between exchange coordinators if there exist more than one coordinator for the department. This is done by distributing universities among coordinators. Universities will be assigned to coordinators automatically. After that, Coordinators will be able to change the universities among themselves if they want.

3.3.7 Process Monitoring

The students who applied to the exchange program will be able to track the status of their applications after the initial placements. They will be able to observe at which stage their exchange process is, whose approval they are waiting for, the problems encountered during the process and the required steps for them to do for their exchange process. Likewise, the authorities will be able to observe the decisions made by other authorities. The advantage of this process being on ERSMS is that the exchange related messages-mails/notifications will be gathered in a single platform. For example, the students may forget to send the carbon copies of the emails to all the related authorities. ERSMS will automate this process and will send the notifications to all the related authorities. Additionally, the application process can be canceled under student's desire or exchange coordinator's desire.

3.3.8 Messaging

Users will be able to send messages to each other. This functionality will improve the connection between the stakeholders of the whole exchange process (department chair to student). This functionality will also make the arrangement of appointments between the exchange coordinators and students possible.

3.3.9 General Form, Request and Decision Logging

The forms and requests that are sent by the users will be logged (stored) in the database. These forms and requests are, but not limited to, pre-approval forms, course transfer forms and course equivalence requests. Additionally, the decisions relevant to the requests and forms logged in the system will be also saved. For instance, the decisions made by the Faculty Administration Board (especially) regarding a student's course transfer form will be logged in the system. The logs will also support query functionality for easier form and request management.

3.3.10 Previously Accepted and Transferred Course Database

Previously accepted and transferred courses will be logged in a database which will be available to students, department chairs, course coordinators, instructors, exchange coordinators and deans. Additionally, the privileged users (in essence, course coordinators, instructors, exchange coordinators, deans and department

chairs) will be able to manage previously accepted and transferred courses and add new accepted and transferred courses to the database.

3.3.11 Social Aspect

Students will be able to view the information about the other students that are going or previously went to the same school as themselves. This way students can learn from the experiences of the former students and meet with other students from Bilkent University.

3.4 Non-functional Requirements

3.4.1 Usability

As the project is designed to improve the current exchange application process experience, the system has to provide a clear and understandable interface especially for the exchange coordinators. Students should be able to carry out their tasks without any problems through a digital platform and simple tasks like placement of the students have to be done automatically. For UI to be clear and concise:

- The items in the “to-do list” of both the exchange coordinators and the students will be bold to draw attention.
- The key attributes such as uploading a pre-approval form or a syllabus will be done by a single button click.
- The coloring of the statuses of the forms should match. For example, if the form is rejected it will appear as red and if it is accepted, it will appear green.
- Responsive design approach will be used, such that when the users reach the application with different devices ERSMS will fit in to these devices’ screen size (i.e., 1024x768, 1920x1080, and more).
- Notifications about messages sent to Erasmus coordinators and students will be always reachable from the navigation panel with at most 2 clicks.
- Soft colors and their tones (such as white (RGB: 255, 255, 255), grey (RGB: 128, 128, 128), and cream (RGB: 255, 253, 208)) will be used in the background for a more understandable interface.

3.4.2 Reliability

Reliability is one of the key non-functional requirements because of the fact that managing an Erasmus process is too important to have any loose ends. Hence, the system has to function predictable and all user expectations must be satisfied. For this:

- It will be ensured that ERSMS will have an uptime rate of 95% at least (can be testable and trackable via insights from the cloud provider, such as AWS).
- In order to minimize any kind of data loss, database backups will be performed in every 12 hours.

3.4.3 Security/Safety

The system includes personal information about the students which should be kept private and protected from unauthorized attacks.

- Only limited information about the students (names, departments, their host universities and email addresses) will be visible to other students so that the privacy of students is not violated.
- Passwords of the students will be encrypted using the BCrypt hashing algorithm and saved to the database after encryption.

- Students will be able to sign up to the system after the placements are done. This ensures that irrelevant students will not be a part of the system.
- Each student can only have a single account registered in the system which is matched with their Bilkent University email addresses.
- Email authentication has to be sent to the students during sign up so that the true identity of the students is verified. Therefore, students will not be able to sign up on the behalf of other students.

3.4.4 Performance

The goal of this project is to make things easier and faster for all stakeholders, so a slow working system would be almost meaningless.

- The email will be sent to the user within one minute after he/she is signed up.
- The login and logout process will take less than 5 seconds.
- Navigation among different pages in the app will take less than 5 seconds.
- Transfer of PDF files will take less than 10 seconds.

3.4.5 Maintainability

ERSMS will have a modular design which can be easily extended, modified and improved.

- The class structure will be formed to reduce the total lines of code and enhance the extendibility. The object-oriented software engineering features such as encapsulation and polymorphism will be used to make the project easy-to-extend. This also will ease the bug-fixing process. Considering these aspects, source code of the ERSMS will have at least 85% Maintainability Index score from the Visual Studio Code Metrics tool.
- Source code documentation will be provided through DocFX v3 to enable different developers to understand the code without much effort.

3.5 Pseudo Requirements

- The project should be implemented as a web application, as the stakeholder Can Alkan mentioned.
- Considering the scope of the CS319 Object-Oriented Software Engineering course, the project should be implemented in an object-oriented programming language.
- The project's source code should be trackable on GitHub using Git.

3.5

System Models

3.5.1 Use Case Model (For high quality interactive version (i.e. association lines can be tracked easily) refer to <https://online.visual-paradigm.com/community/share/ersms-use-case-diagram-16p>

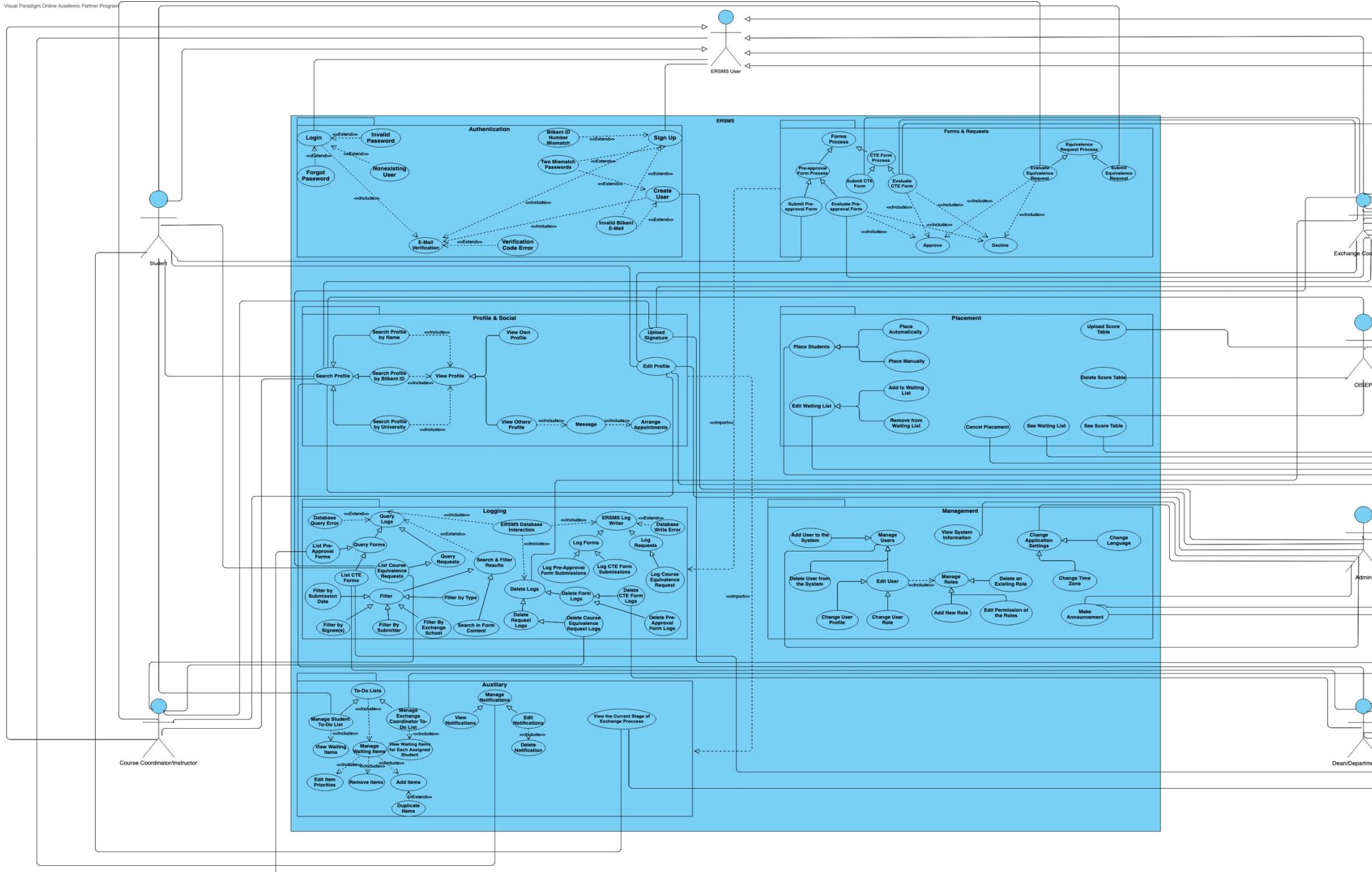


Figure 1: UML Use Case Diagram of the ERSMS Application

Authentication Package

1. **Name:** Login
2. **Participating Actor:** ERSMS User
3. **Entry Condition:** Opening the app through a web browser.
4. **Exit Condition:** User signs in or the login process fails.
5. **Flow of Events:**
 - 5.1. The user decides to log in.
 - 5.2. The user fills the email and password bars in the login page.
 - 5.3 If the user enters the password incorrectly
 - 5.3.1 “Invalid Password” error message is displayed.
 - 5.4 Else if the user email does not exist
 - 5.4.1 “Non-existing User” error message is displayed
 - 5.5 Else the user logs in successfully.
 - 5.5.1 A verification mail is sent to the entered email address.

1. **Name:** Sign Up
2. **Participating Actor:** ERSMS User
3. **Entry Condition:** Clicking the “Sign Up” button on the “Log In” page.
4. **Exit Condition:** Clicking the “Cancel” button or successfully signing up.
5. **Flow of Events:**
 - 5.1. The user clicks the sign up button on the “Log In” page.
 - 5.2. If an invalid id is used during sign up
 - 5.2.1 “Invalid Bilkent University ID Number” error message is displayed.
 - 5.3 Else if two passwords entered during the sign up do not match
 - 5.3.1 “Password does not Match” error message is displayed.
 - 5.4 Else if invalid Bilkent University email is entered during the sign up
 - 5.4.1 “Invalid Bilkent University Email” error message is displayed.
 - 5.5 Else the user signs up successfully.
 - 5.5.1 A verification mail is sent to the entered email address

Forms & Requests Package

1. **Name:** Submit Pre-approval Form
2. **Participating Actor:** Student
3. **Entry Condition:** Being a student and uploading the pre-approval form from the “Forms and Requests” page.
4. **Exit Condition:** Clicking the “Upload” or “Cancel” button.
5. **Flow of Events:**
 - 5.1. The student decides to upload his/her pre-approval form.
 - 5.2. Through the “Forms and Requests” page, he/she clicks the “Submit Pre-approval Form” button.
 - 5.3. After filling the necessary fields regarding the courses, the student submits the form which is sent to the exchange coordinator.

- 1. Name:** Evaluate Pre-approval Form
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and clicking on one of the forms sent by the students.
- 4. Exit Condition:** Approving or declining the form.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to view a form sent by the students.
 - 5.2.** The exchange coordinator clicks on one of the forms from the "Forms and Requests" page.
 - 5.3.** Based on the contents, either he/she approves it by signing it or declines the form.

- 1. Name:** Submit CTE Form
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** The host school has sent the transcript and the exchange coordinator clicks the "Create CTE Form" button.
- 4. Exit Condition:** Clicking the "Submit" or "Cancel" button.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to create the CTE form based on the transcript sent by the host school.
 - 5.2.** Through the "Forms and Requests" page, the coordinator clicks the "Create CTE Form" button.
 - 5.3.** After viewing the transcript and making necessary adjustments (merging or declining a course), the coordinator submits the form.

- 1. Name:** Evaluate CTE Form
- 2. Participating Actor:** Exchange Coordinator, Dean/Department Chair
- 3. Entry Condition:** Being the department chair and clicking on one of the CTE forms.
- 4. Exit Condition:** Approving or declining the form.
- 5. Flow of Events:**
 - 5.1.** The department chair decides to view a form submitted by the exchange coordinator.
 - 5.2.** The department chair clicks on one of the forms from the "Forms and Requests" page.
 - 5.3.** Based on the contents, either he/she approves it by signing it or declines the form.

- 1. Name:** Submit Equivalence Request
- 2. Participating Actor:** Student
- 3. Entry Condition:** Being a student and uploading the syllabus from the “Forms and Requests” page.
- 4. Exit Condition:** Clicking the “Upload” or “Cancel” button.
- 5. Flow of Events:**

5.1. The student decides to upload a syllabus to make it equivalent with one of the courses in Bilkent University.
5.2. Through the “Forms and Requests” page, he/she clicks the “Submit Other Form” button.
5.3. The student uploads the syllabus and sends the equivalence request.

- 1. Name:** Evaluate Equivalence Request
- 2. Participating Actor:** Course Coordinator/Instructor
- 3. Entry Condition:** Being a course coordinator or instructor and clicking on one of the equivalence requests sent by the students.
- 4. Exit Condition:** Approving or declining the request.
- 5. Flow of Events:**

5.1. The course coordinator or instructor decides to view the request sent by the students.
5.2. The course coordinator or instructor clicks on one of the requests from the “Forms and Requests” page.
5.3. After downloading the syllabus and viewing it, either he/she approves or declines it.

Placement Package

- 1. Name:** Place Manually
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and clicking the “Manual Placement” button on the “Placements” page.
- 4. Exit Condition:** Clicking the “Save Placements” or “Cancel” button.
- 5. Flow of Events:**

5.1. The exchange coordinator decides to manage a student’s placement manually.
5.2. The exchange coordinator opens the “Placement” page and clicks the manual placement button.
5.3. From the opened page, the coordinator finds the students by entering his/her ID to the search bar.
5.4. The coordinator selects the students and assigns him/her to the host university and saves the changes.

- 1. Name:** Place Automatically
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and clicking the “Automatic Placement” button on the “Placements” page.
- 4. Exit Condition:** Clicking the “Save Placements” or “Cancel” button.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to manage the placement of all students automatically.
 - 5.2.** The exchange coordinator opens the “Placements” page and clicks the automatic placement button.
 - 5.3.** From the opened page, the coordinator clicks the “Conduct Automatic Placement” button.
 - 5.4.** After the placements are done by the system, the coordinator saves or cancels the changes.

-
- 1. Name:** See Waiting List
 - 2. Participating Actor:** Exchange Coordinator
 - 3. Entry Condition:** Being an exchange coordinator and clicking the “Waiting List” option from the main menu.
 - 4. Exit Condition:** Navigating to another page on the ERSMS application or clicking the “Add to Waiting List” or “Remove a student” buttons in the “Waiting List” page.
 - 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to see the students in the waiting list.
 - 5.2.** The exchange coordinator clicks the “Waiting List” option from the main menu that opens the “Waiting List” page with a list of students in the waiting list.

-
- 1. Name:** Add to Waiting List
 - 2. Participating Actor:** Exchange Coordinator
 - 3. Entry Condition:** Being an exchange coordinator and clicking the “Add to Waiting List” button on the “Waiting List” page.
 - 4. Exit Condition:** Clicking to “Add” or “Cancel” buttons.
 - 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to add a student to the waiting list.
 - 5.2.** The exchange coordinator opens the “Waiting List” page and clicks the “Add to Waiting List” button.
 - 5.3.** From the opened page, the coordinator finds the student to add by entering his/her ID to the search bar.
 - 5.4.** The coordinator selects the student and clicks the “Add” button.

- 1. Name:** Remove from Waiting List
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and clicking the “Remove a student” button on the “Waiting List” page.
- 4. Exit Condition:** Clicking the “Remove” or “Cancel” buttons.
- 5. Flow of Events:**

- 5.1.** The exchange coordinator decides to remove a student from the waiting list.
- 5.2.** The exchange coordinator opens the “Waiting List” page and clicks the “Remove a student” button.
- 5.3.** From the opened page, the coordinator selects the student as the students are already listed in the waiting list.
- 5.4.** The coordinator removes the student by clicking the “Remove” button.

-
- 1. Name:** Cancel Placement
 - 2. Participating Actor:** Exchange Coordinator
 - 3. Entry Condition:** Being an exchange coordinator and clicking the “Cancel Placement” button for a specific student in the “Placements” page.
 - 4. Exit Condition:** Clicking the “Confirm Cancellation” or “Cancel” buttons.
 - 5. Flow of Events:**

- 5.1.** The exchange coordinator decides to cancel the placement of a student to a host university.
- 5.2.** The exchange coordinator opens the “Placements” page and sees the placements already done.
- 5.3.** The coordinator clicks the “Cancel Placement” button.
- 5.4.** The coordinator confirms the process by clicking the “Confirm Cancellation” button.

-
- 1. Name:** See Score Table
 - 2. Participating Actor:** Exchange Coordinator, OISEP
 - 3. Entry Condition:** Being an exchange coordinator or an authorized person from OISEP and clicking the “Score Table” option from the main menu.
 - 4. Exit Condition:** Navigating to another page on the ERSMS application.
 - 5. Flow of Events:**
- 5.1.** The exchange coordinator or the authorized person in OISEP decide to see the score table.
 - 5.2.** The exchange coordinator or the authorized person in OISEP click the “Score Table” option from the main menu.

- 1. Name:** Upload Score Table
- 2. Participating Actor:** OISEP
- 3. Entry Condition:** Being an authorized person from OISEP and clicking the “Upload Score Table” button in the “Score Table” page.
- 4. Exit Condition:** Clicking the “Upload” or “Cancel” buttons
- 5. Flow of Events:**
 - 5.1.** The authorized person from OISEP decides to upload the score table.
 - 5.2.** The authorized person from OISEP opens the “Score Table” page and clicks the “Upload Score Table” button.
 - 5.3.** From the opened page, the person selects the file to upload and clicks the “Upload” button.

- 1. Name:** Delete Score Table
- 2. Participating Actor:** OISEP
- 3. Entry Condition:** Being an authorized person from OISEP and clicking the “Delete Score Table” button in the “Score Table” page.
- 4. Exit Condition:** Clicking the “Delete” or “Cancel” buttons.
- 5. Flow of Events:**
 - 5.1.** The authorized person from OISEP decides to delete the score table.
 - 5.2.** The authorized person from OISEP opens the “Score Table” page and clicks the “Delete Score Table” button.

Management Package

- 1. Name:** Add User to the System
- 2. Participating Actor:** Admin
- 3. Entry Condition:** Being an admin actor and entering the management panel.
- 4. Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.
- 5. Flow of Events:**
 - 5.1.** A participating actor decides to add a new user to the system.
 - 5.2.** A participating actor opens the management panel and selects an option to add a user to the system.
 - 5.3.** From the opened page, the participating actor adds user to the system by entering required information to specified fields and clicking the add user button.

1. **Name:** Delete User from the System
2. **Participating Actor:** Admin
3. **Entry Condition:** Being an actor and entering the management panel.
4. **Exit Condition:** Exiting the change profile panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to delete a user from the system.
- 5.2. A participating actor opens the management panel and selects an option to delete users from the system.
- 5.3. From the opened page, the participating actor deletes the desired user from the system by clicking delete button.

-
1. **Name:** Change User Profile
 2. **Participating Actor:** Admin
 3. **Entry Condition:** Being an admin and clicking the change profile button on the user profile.

4. **Exit Condition:** Exiting the change profile panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to change the profile of a user.
- 5.2. A participating actor finds desired user's profile and clicks the change profile button.
- 5.3. From the opened page, participating actor changes the profile information of the desired user and saves the changes by clicking the save button.

-
1. **Name:** Change User Role
 2. **Participating Actor:** Admin
 3. **Entry Condition:** Being an admin and clicking the change role button on the profile of the desired user.

4. **Exit Condition:** Exiting the change role panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to change the role of a user.
- 5.2. A participating actor finds desired user's profile and clicks the change role button.
- 5.3. From the opened page, participating actor changes the role of the user and saves the changes by clicking the save button.

- 1. Name:** Add New Role
- 2. Participating Actor:** Admin
- 3. Entry Condition:** Being an admin and entering the management panel.
- 4. Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

- 5. Flow of Events:**

- 5.1.** A participating actor decides to add a new role to the list of roles in the system.
 - 5.2.** A participating actor opens the management panel and selects an option to add a new role.
 - 5.3.** From the opened page, A participating actor decides the name and the permissions of the role, then saves it by clicking the save button.

- 1. Name:** Delete an Existing Role
- 2. Participating Actor:** Admin
- 3. Entry Condition:** Being an Admin and entering the management panel.
- 4. Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

- 5. Flow of Events:**

- 5.1.** A participating actor decides to delete an existing role from the system.
 - 5.2.** A participating actor opens the management panel and selects an option to edit roles.
 - 5.3.** From the opened page, the participating actor selects the desired role from the list of roles and clicks the delete button to delete the role from the system if it is not one of the default roles. Default roles are Student, Exchange coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair and ERSMS User. The users with deleted roles will have the new role of ERSMS User.

- 1. Name:** Edit Permission of the Roles
- 2. Participating Actor:** Admin
- 3. Entry Condition:** Being an admin and entering the management panel.
- 4. Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

- 5. Flow of Events:**

- 5.1.** A participating actor decides to change the permission of an existing role in the system.
 - 5.2.** A participating actor opens the management panel and selects an option to edit roles.
 - 5.3.** From the opened page, the participating actor selects the desired role from the list of roles, decides the permissions of the desired role and then saves it by clicking the save button if the desired role is not ERSMS User. Permissions of the ERSMS User role cannot be changed.

1. **Name:** Change Time Zone
2. **Participating Actor:** Admin
3. **Entry Condition:** Being an admin and entering the management panel.
4. **Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to change the time zone of the system.
 - 5.2. A participating actor chooses the new time zone and then clicks the save button to save the change.

-
1. **Name:** Change Language
 2. **Participating Actor:** Admin
 3. **Entry Condition:** Being an admin and entering the management panel.
 4. **Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to change the language of the system.
 - 5.2. A participating actor chooses the new language from the language list and then clicks the save button to save the change.

-
1. **Name:** View System Information
 2. **Participating Actor:** Admin
 3. **Entry Condition:** Being an admin and entering the management panel.
 4. **Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to view the system information of the system.
 - 5.2. A participating actor clicks the view system information button and sees the details.

-
1. **Name:** Make Announcement
 2. **Participating Actor:** Exchange Coordinator, Dean/Department Chair, Admin
 3. **Entry Condition:** Entering the management panel.
 4. **Exit Condition:** Exiting the management panel by navigating another page on the ERSMS application.

5. **Flow of Events:**

- 5.1. A participating actor decides to make an announcement to the users.
 - 5.2. A participating actor opens the management panel and selects an option to make an announcement.
 - 5.3. In the opened page, the participating actor enters the text of the announcement then makes the announcement by clicking the button.

Profile & Social Package

1. **Name:** Search Profile by Name
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Entering the search section from the main menu.
4. **Exit Condition:** Navigating to the profile view or another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to search users by their name.
 - 5.2. The actor enters the search view and searches users by their name.
 - 5.3. The actor can then go to a profile from the results to see the details.

1. **Name:** Search Profile by Bilkent ID Number
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Entering the search section from the main menu.
4. **Exit Condition:** Navigating to the profile view or another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to search users by their Bilkent ID Number.
 - 5.2. The actor enters the search view and searches for a user by their Bilkent ID Number.

1. **Name:** Search Profile by University
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Entering the search section from the main menu.
4. **Exit Condition:** Navigating to the profile view or another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to search users by their university.
 - 5.2. The actor enters the search view and searches for a user by their exchange university.

1. **Name:** View Own Profile
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Entering the profile section from the main menu.
4. **Exit Condition:** Navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to view their profile.
 - 5.2. The actor navigates to their profile by clicking the profile button on the main menu.

1. **Name:** View Others' Profile
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Searching users from the search section and navigating to a user from the results section.
4. **Exit Condition:** Navigating to the message view or to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to view a user by their university.
 - 5.2. The actor enters the search view and searches for a user by their Bilkent ID Number.
 - 5.3. The actor navigates to a profile from the results to see the details.

1. **Name:** Edit Profile
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Navigating to own profile and clicking to the edit button.
4. **Exit Condition:** Clicking to the save button or navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to edit their profile.
 - 5.2. The actor enters their profile and clicks the edit button.
 - 5.3. The actor makes the changes and clicks the save button.

1. **Name:** Message
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Navigating to a user's profile and clicking to the message button.
4. **Exit Condition:** Navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to message a user.
 - 5.2. The actor searches for the user and navigates to the user's profile.
 - 5.3. The actor enters the message section and sends their message.

1. **Name:** Arrange Appointments
2. **Participating Actor:** Student, Exchange Coordinator, Course Coordinator/Instructor, Admin, Dean/Department Chair
3. **Entry Condition:** Navigating to the message section in a user's profile and clicking the arrange appointment button.
4. **Exit Condition:** Navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to message a user.
 - 5.2. The actor searches for the user and navigates to the user's profile.
 - 5.3. The actor enters the message section.
 - 5.4. The actor arranges the appointment from the message section.

1. **Name:** Upload Signature
2. **Participating Actor:** Exchange Coordinator, Course Coordinator/Instructor, Dean/Department Chair
3. **Entry Condition:** Navigating to the actor's profile and clicking the upload signature button.
4. **Exit Condition:** Clicking the save button or navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. A participating actor decides to upload their signature.
 - 5.2. The actor enters their profile and clicks the upload signature button.
 - 5.3. The actor uploads and saves their signature.

Logging Package

1. **Name:** List Pre-Approval Forms
2. **Participating Actor:** Exchange Coordinator
3. **Entry Condition:** Being an exchange coordinator and entering the logging panel.
4. **Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. The exchange coordinator decides to list the current and previous pre-approval forms.
 - 5.2. The exchange coordinator opens the logging panel and selects an option to list pre-approval forms.
 - 5.3. From the opened page, the coordinator sees all the current and previous pre-approval forms. These results can be filtered and searched as well.
 - 5.4. The coordinator can get the details of the forms by clicking on the entries listed on the page.

- 1. Name:** List CTE Forms
- 2. Participating Actor:** Exchange Coordinator, Dean/Department Chair
- 3. Entry Condition:** Being an exchange coordinator or dean/department chair and entering the logging panel.
- 4. Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator or dean/department chair decides to list the current and previous CTE forms.
 - 5.2.** The exchange coordinator or dean/department chair opens the logging panel and selects an option to list CTE forms.
 - 5.3.** From the opened page, the coordinator sees all the current and previous CTE forms. These results can be filtered and searched as well.
 - 5.4.** The coordinator can get the details of the forms by clicking on the entries listed on the page.

- 1. Name:** List Course Equivalence Requests
- 2. Participating Actor:** Exchange Coordinator, Course Coordinator/Instructor, Student
- 3. Entry Condition:** Being a participating actor and entering the logging panel.
- 4. Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
- 5. Flow of Events:**
 - 5.1.** The participating actor decides to list the submitted course equivalence requests.
 - 5.2.** The participating actor opens the logging panel and selects an option to list course equivalence requests.
 - 5.3.** Depending on the participating actor's role different aspects of this use case is displayed. For example, students can only see the previous decisions, course coordinators/instructors can see the previous decisions and current requests which are related to them, whereas exchange coordinators have access to all aspects to this use case.
 - 5.5.** From the opened page, the participating actor sees all the relevant course equivalence requests information. These results can be filtered and searched as well.
 - 5.6.** The participating actor can get the details of the forms by clicking on the entries listed on the page.

- 1. Name:** Delete Pre-Approval Form Logs
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and entering the logging panel.
- 4. Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to delete either current and previous pre-approval forms.
 - 5.2.** The exchange coordinator opens the logging panel and selects an option to list pre-approval forms.
 - 5.3.** From the opened page, the exchange coordinator finds the desired pre-approval form(s) to be deleted with the help of the filter and search feature.
 - 5.4.** The exchange coordinator can delete the desired entries by clicking on the delete icon after marking them with checkboxes.

-
- 1. Name:** Delete CTE Form Logs
 - 2. Participating Actor:** Exchange Coordinator, Dean/Department Chair
 - 3. Entry Condition:** Being an exchange coordinator or dean/department chair and entering the logging panel.
 - 4. Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
 - 5. Flow of Events:**
 - 5.1.** The exchange coordinator or dean/department chair decides to delete either current and previous CTE forms.
 - 5.2.** The exchange coordinator or dean/department chair opens the logging panel and selects an option to list CTE forms.
 - 5.3.** From the opened page, the coordinator or the dean/department chair finds the desired pre-approval form(s) to be deleted with the help of the filter and search feature.
 - 5.4.** The coordinator or the dean/department chair can delete the desired entries by clicking on the delete icon after marking them with checkboxes.

1. **Name:** Delete Course Equivalence Request Logs
2. **Participating Actor:** Exchange Coordinator, Course Coordinator/Instructor
3. **Entry Condition:** Being an exchange coordinator or course coordinator/instructor and entering the logging panel.
4. **Exit Condition:** Exiting the logging panel by navigating another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. The exchange coordinator or course coordinator/instructor decides to delete either current and previous course equivalence requests.
 - 5.2. The exchange coordinator or course coordinator/instructor opens the logging panel and selects an option to list course equivalence requests.
 - 5.3. From the opened page, the coordinator finds the desired course equivalence request(s) to be deleted with the help of the filter and search feature.
 - 5.4. The coordinator can delete the desired entries by clicking on the delete icon after marking them with checkboxes.

Auxiliary Package

1. **Name:** Manage Student To-Do List
2. **Participating Actor:** Student
3. **Entry Condition:** Being a student (selected exchange student with an account) and entering the To-Do panel in the program or entering the homepage of the program.
4. **Exit Condition:** Exiting the To-Do panel or the home page by navigating on the ERSMS application.
5. **Flow of Events:**
 - 5.1. The exchange student decides to see the To-Do list of things regarding the exchange.
 - 5.2. The exchange student opens the To-Do panel or navigates to the homepage (either by logging in the system or navigating through the application).
 - 5.3. From the opened panel, the student can view all the current and previous items/actions/tasks that are either waiting to be done or completed.
 - 5.4. The student can get the details of the items by clicking on the entries listed on the to-do list.
 - 5.5. Students can choose to manage these items by reordering their priorities, marking an item as completed, removing the completed items from the list or adding new items to the to-do list.

- 1. Name:** Manage Exchange Coordinator To-Do List
- 2. Participating Actor:** Exchange Coordinator
- 3. Entry Condition:** Being an exchange coordinator and entering the To-Do panel in the program or entering the homepage of the program.
- 4. Exit Condition:** Exiting the To-Do panel or the home page by navigating on the ERSMS application.
- 5. Flow of Events:**
 - 5.1.** The exchange coordinator decides to see the To-Do list of things regarding the exchange.
 - 5.2.** The exchange coordinator opens the To-Do panel or navigates to the homepage (either by logging in the system or navigating through the application).
 - 5.3.** From the opened panel, the coordinator can view all the current and previous items/actions/tasks that are either waiting to be done or completed. Additionally, the coordinator can choose a specific student, who is assigned to the coordinator, and view the to-do list for that student (things that the coordinator needs to do for that specific student).
 - 5.4.** The coordinator can get the details of the items by clicking on the entries listed on the to-do list.
 - 5.5.** Coordinator can choose to manage these items by reordering their priorities, marking an item as completed, removing the completed items from the list or adding new items to the to-do list.

-
- 1. Name:** View Notifications
 - 2. Participating Actor:** ERSMS User
 - 3. Entry Condition:** Being a valid ERSMS User (i.e., having a valid account that can sign in to the system) and clicking on the notification icon or by navigating to the notification panel.
 - 4. Exit Condition:** Exiting the notification panel or by navigating to another page on the ERSMS application.
 - 5. Flow of Events:**
 - 5.1.** The user decides to see the notifications.
 - 5.2.** The user opens the notification panel by either clicking on the notification icon or by navigating to the notification panel on the application.
 - 5.3.** From the opened panel, the user can view all the newly and previously received notifications in the order of arrival (newest notification will appear first).
 - 5.4.** The user can get the details of a notification by clicking on a specific notification.

1. **Name:** Edit Notifications
2. **Participating Actor:** ERSMS User
3. **Entry Condition:** Being a valid ERSMS User (i.e., having a valid account that can sign in to the system) and clicking on the notification icon or by navigating to the notification panel.
4. **Exit Condition:** Exiting the notification panel or by navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. The user decides to edit the notifications.
 - 5.2. The user opens the notification panel by either clicking on the notification icon or by navigating to the notification panel on the application.
 - 5.3. From the opened panel, the user can view all the newly and previously received notifications in the order of arrival (newest notification will appear first).
 - 5.4. The user clicks on a specific notification in order to get its details by opening the details panel.
 - 5.5. In the details page or in the list view of notifications the user can choose to manage these notifications by either marking them as read or by deleting them.

1. **Name:** View the Current Stage of Exchange Process
2. **Participating Actor:** Student, Exchange Coordinator
3. **Entry Condition:** Being a participating actor and entering a student's profile details page.
4. **Exit Condition:** Exiting the student's profile details page or by navigating to another page on the ERSMS application.
5. **Flow of Events:**
 - 5.1. The actor decides to view the current stage of a student's exchange process.
 - 5.2. The actor opens a student's profile details page either by searching for a function on the toolbar/menu bar or by clicking their own profile picture (most likely to be at the top right corner of the page [sticky]) on the page in order to open up their own profile detail page.
 - 5.3. From the opened page the actor can see the current stage (application, course selection, on mobility etc.) on the exchange process of the specified/selected student.

3.5.2 Dynamic Models

3.5.2.1 Activity Diagrams

3.5.2.1.1 Activity Diagram for Pre-Approval Form

Visual Paradigm Online Academic Partner Program

Pre-Approval Form Activity Diagram

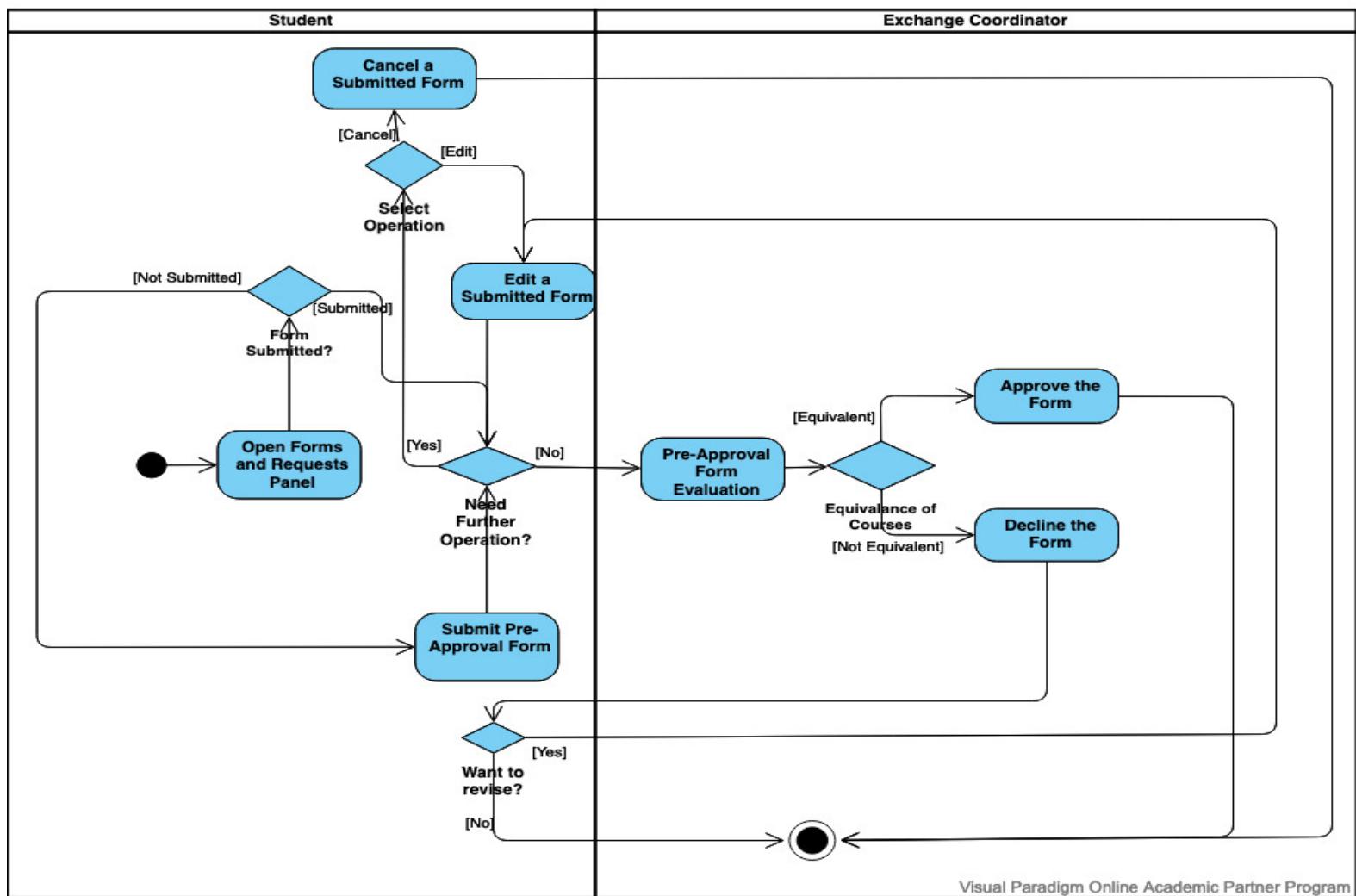


Figure 2: UML Activity Diagram of the Pre-Approval Form Submission and Evaluation Process in ERSMS

Students can edit a submitted pre-approval form (if there is one) or submit a new pre-approval form from the “Forms and Requests” panel. Likewise, exchange coordinator after opening the “Forms and Requests” panel, can evaluate (approve or decline) pre-approval forms according to the equivalency of the courses. Submitted forms can be edited or canceled by the student.

3.5.2.1.2 Activity Diagram for CTE Form

CTE Form Activity Diagram

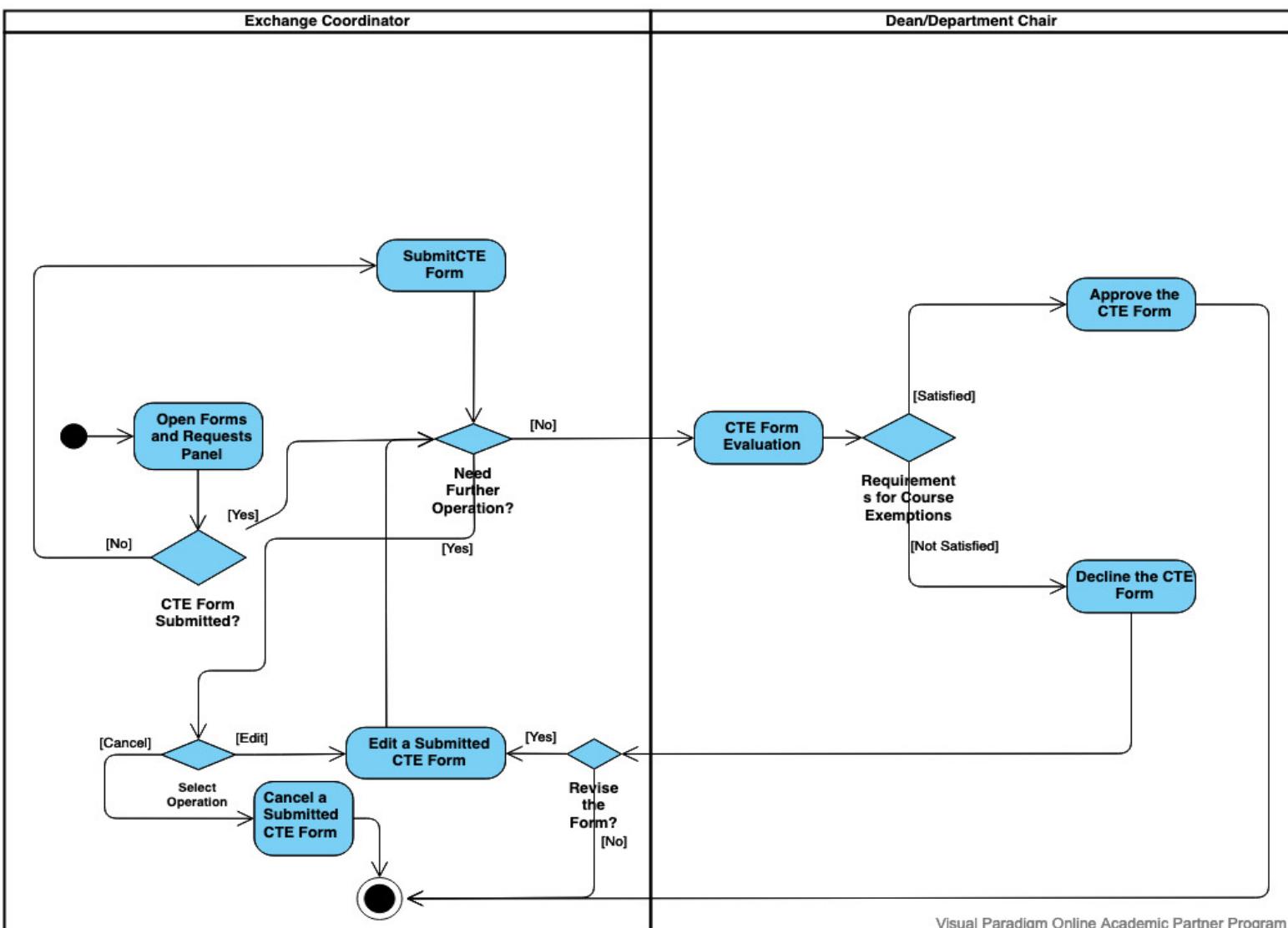


Figure 3: UML Activity Diagram of the CTE Form Submission and Evaluation Process in ERSMS

After opening the “Forms and Requests” panel, exchange coordinators can submit a CTE Form or edit an already submitted one (can also cancel a submitted form). Deans and department chairs can evaluate (approve or decline) the submitted CTE forms according to the course requirements (to be exempted from / transferred to Bilkent). If a form is declined, the exchange coordinator can choose to revise the CTE form by editing and submitting the form.

3.5.2.1.3 Activity Diagram for Placement

Placement Activity Diagram

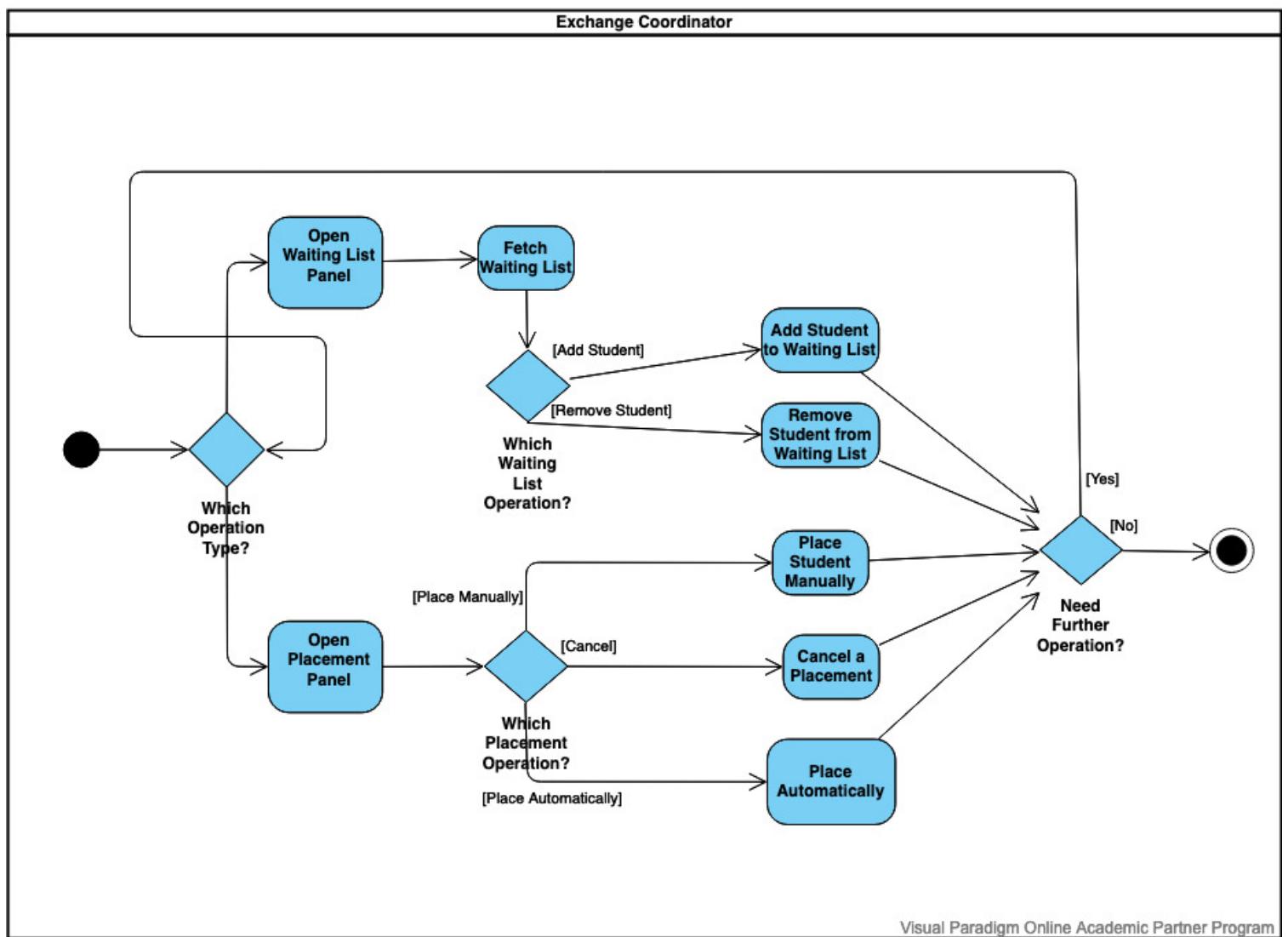


Figure 4: UML Activity Diagram of the Student Placement Process in ERSMS

Exchange coordinators can start the automated placement process or manually place a student to a host institute (for exchange). Exchange coordinators can also cancel a student's placement. Additionally, coordinators can also view and edit (add or drop students) the waiting list for canceled placements, after fetching the waiting list. "Open Placement Panel" activity encapsulates the fetching of the placed student list.

3.5.2.2 State Machine Diagrams

3.5.2.2.1 State Diagram for Roles of Users

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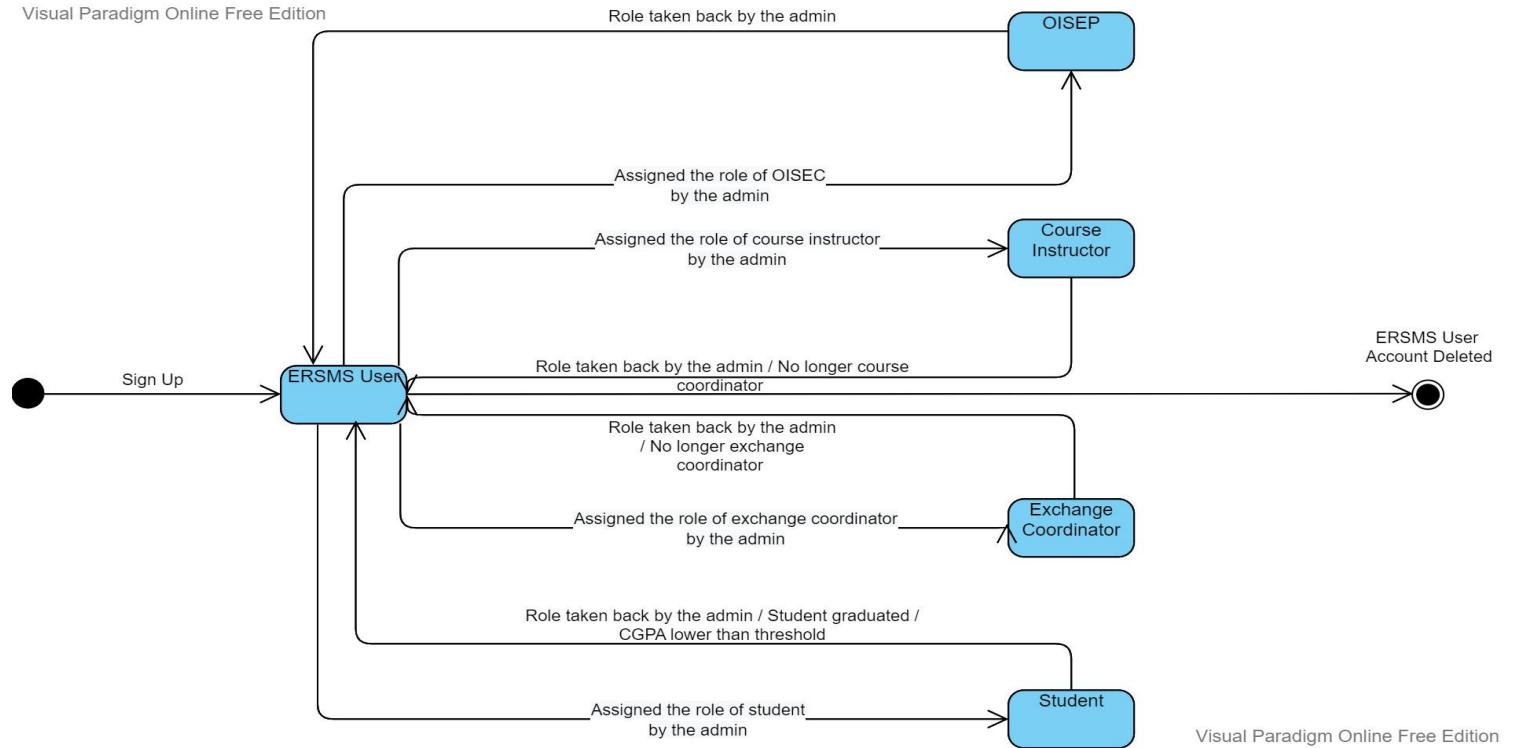


Figure 5: UML State Diagram of the Role Assignment Procedure in ERSMS

As it can be seen, all users extend a generic ERSMS User and then are assigned to their specific roles by the admin. The admin account is embedded on the database and only the admin can determine these specific roles. Naturally, the roles can be taken back depending on certain circumstances explained on the diagram.

3.5.2.2.2 State Diagram for Pre-Approval Forms

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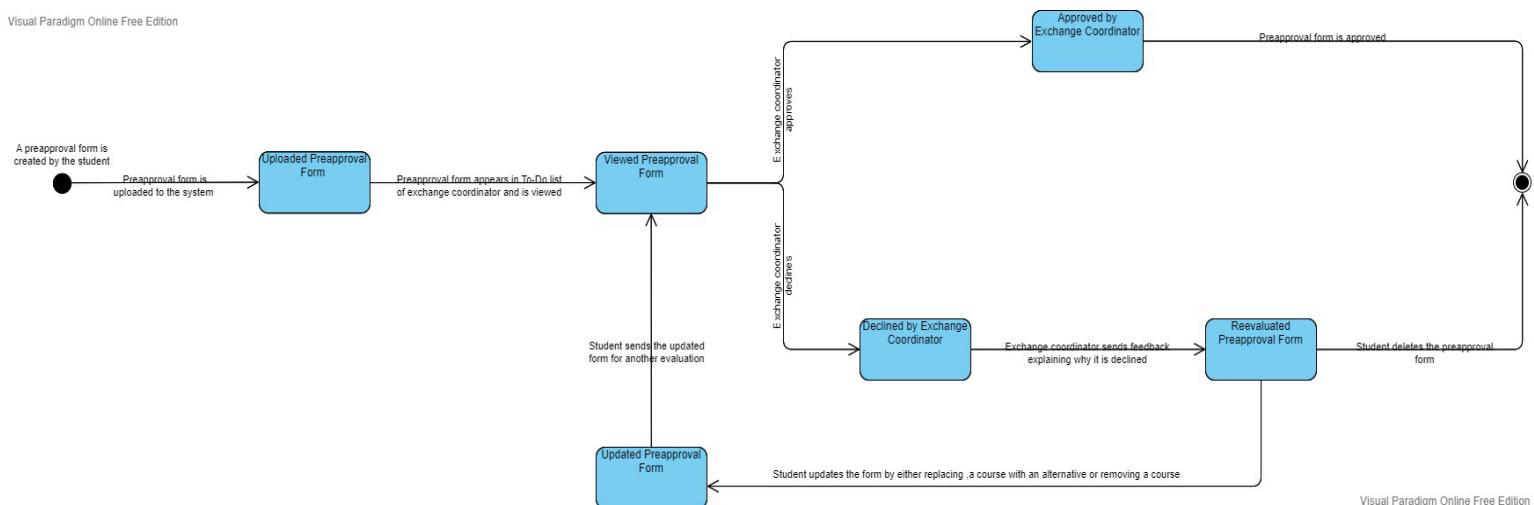
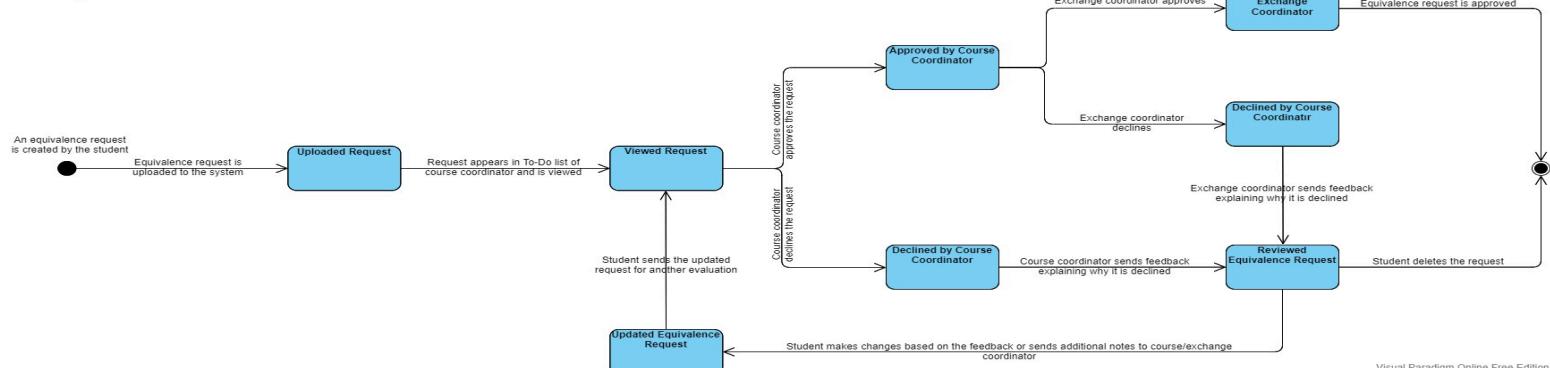


Figure 6: UML State Diagram for Pre-Approval Forms in ERSMS

In this state diagram, first the preapproval form has to be created and uploaded to the system. Later, the exchange coordinator views the form as it also appears in his/her To-Do list. If s/he approves the listed courses, the form is accepted and the final state is reached. Otherwise, the exchange coordinator states the reason why the form is not approved through the system. Based on this feedback, the student can alter the form by changing a course or removing a course. After this procedure, the exchange coordinator can reevaluate the updated form. Naturally, the student can also delete the form after it is declined which is shown in the diagram.

3.5.2.2.3 State Diagram for Course Equivalence Requests

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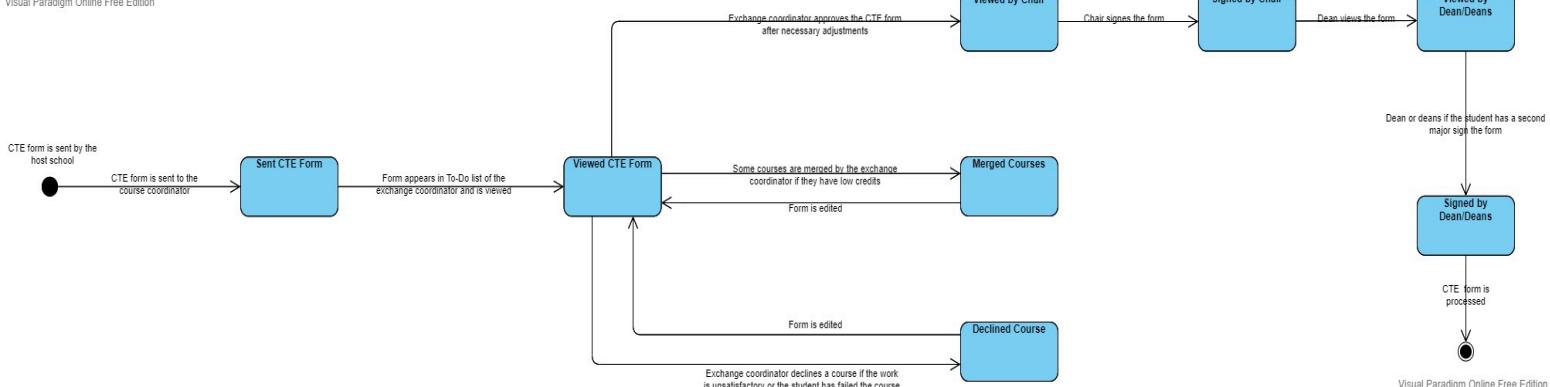
Visual Paradigm Online Free Edition

Figure 7: UML State Diagram for Course Equivalence Requests in ERSMS

In the state diagram for the equivalence requests, the student creates the request and it is sent to the course coordinator containing the syllabus of the desired course. After this, the request emerges in the To-Do list of the course coordinator and he/she views the syllabus. Depending on the content, the course coordinator either approves or declines the request for equivalence. If it is declined, the course coordinator also provides feedback by stating the reason of his/her decision. Based on this feedback, the student can update the request by sending additional notes about the desired course and discussing it with the coordinator. After this procedure, the equivalence request can be reevaluated. When the request is approved by the course coordinator, a similar process is repeated for the exchange coordinator. The form is officially approved after receiving the approvals of both the course and exchange coordinators. Similar to preapproval forms, the student can also cancel the request after it is declined which is shown in the diagram.

3.5.2.2.4 State Diagram for CTE Forms

Visual Paradigm Online Free Edition



Visual Paradigm Online Free Edition

Figure 8: UML State Diagram for CTE Forms in ERSMS

The final state diagram shows the states for the CTE forms. After the host school sends the CTE form, it is reviewed by the exchange coordinator. The exchange coordinator can merge some courses if they have very low credits (in French schools) or decline a course if it was irrelevant or too easy like a project course. Naturally if the student fails a course, it is also declined. After this adjustment, the form is sent to the chair in order to be signed. Finally, it is sent to the dean and the dean of the department signs the form. If the student has a second major, it is also signed by the dean of the second major's department.

3.5.2.3 Sequence Diagrams

3.5.2.3.1 Sequence Diagram for CTE Forms

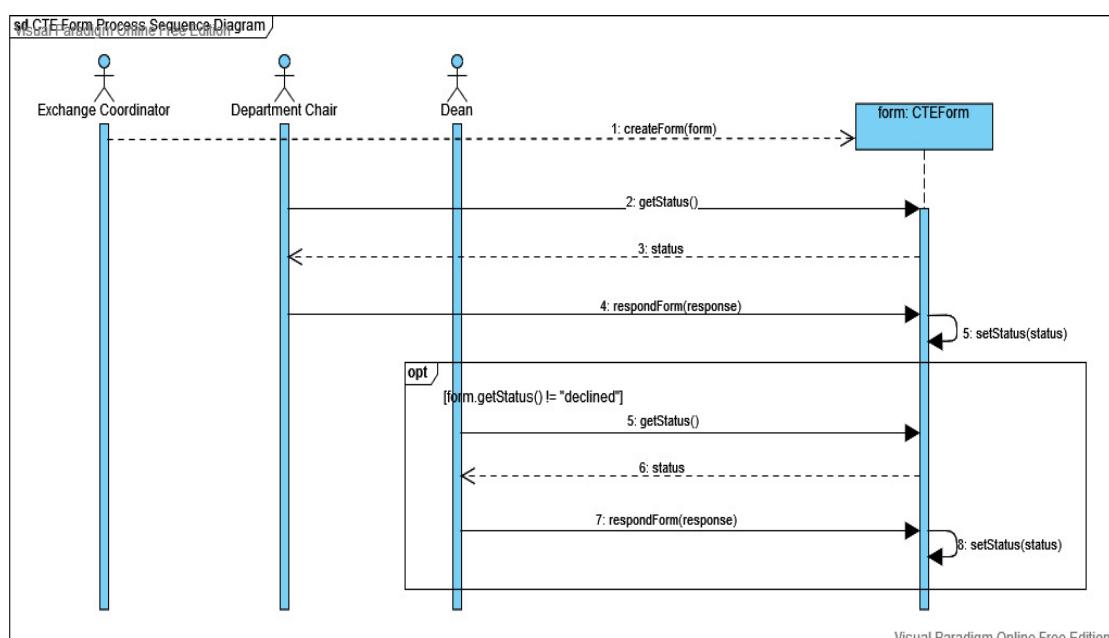


Figure 9: UML Sequence Diagram for CTE Forms in ERSMS

Exchange coordinator receives a transcript from the exchange school and creates a form according to the transcript. Then, the department chair receives the form status and responds to the form. The form takes the response and sets its own status according to the response. Then, if the form is not already declined, the dean receives the form status and responds to the form. According to the response, the form sets its status, and the form process is finalized.

3.5.3 Object and Class Model

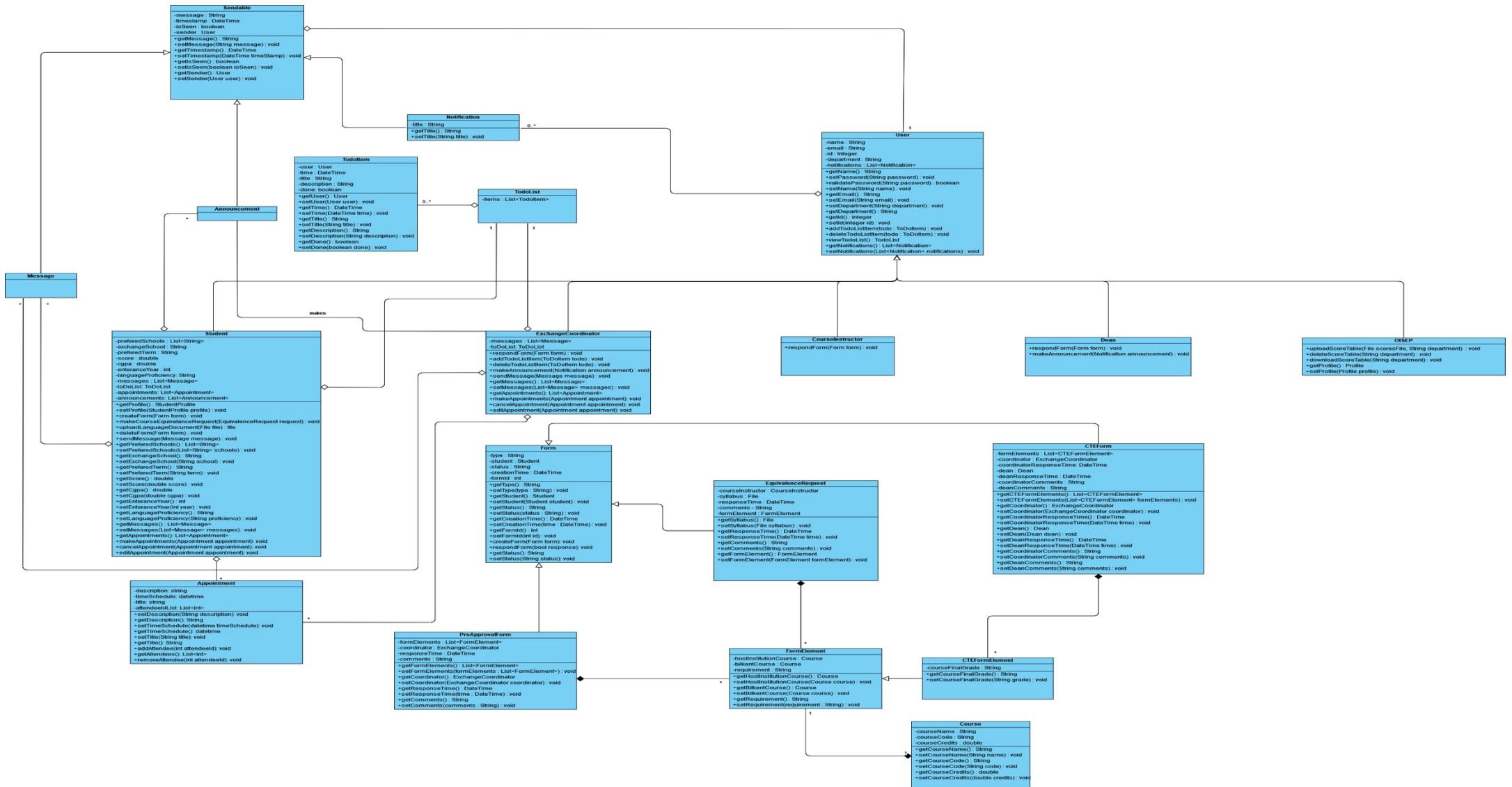


Figure 9: High Level UML Class Diagram of ERSMS

3.5.4 User Interface

3.5.4.1 Login and Sign Up Screens

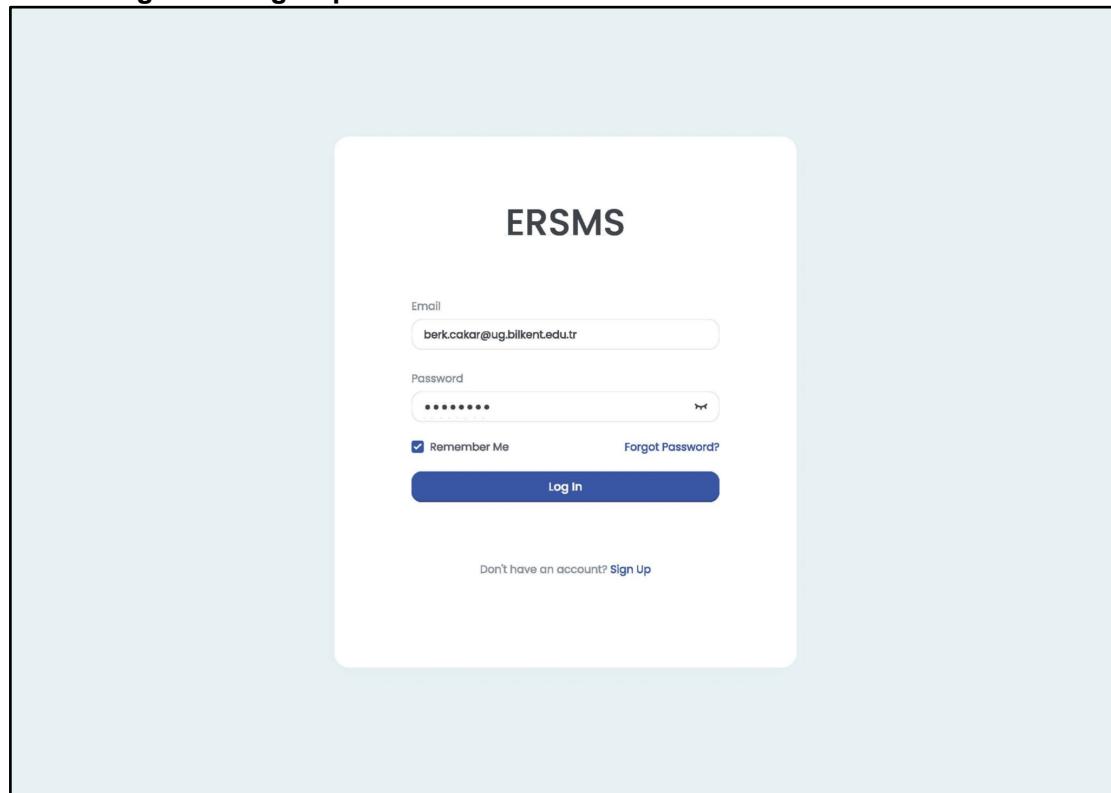


Figure 11: Login Screen of ERSMS

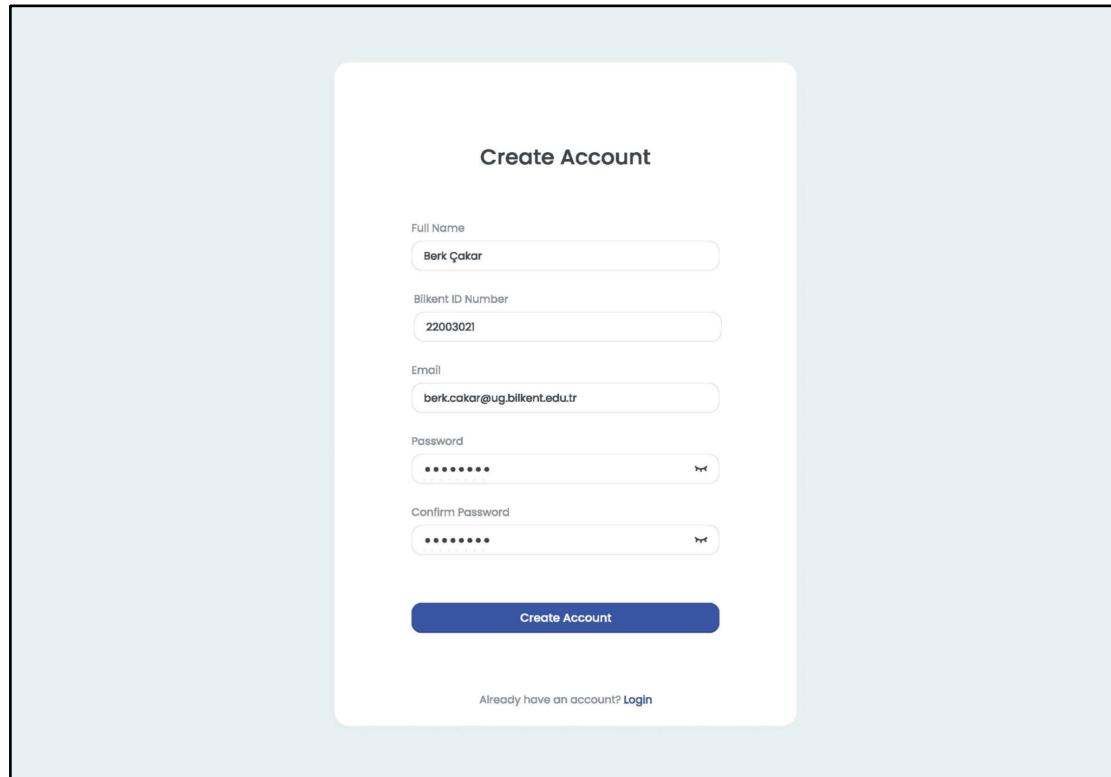


Figure 12: Signup Screen of ERSMS

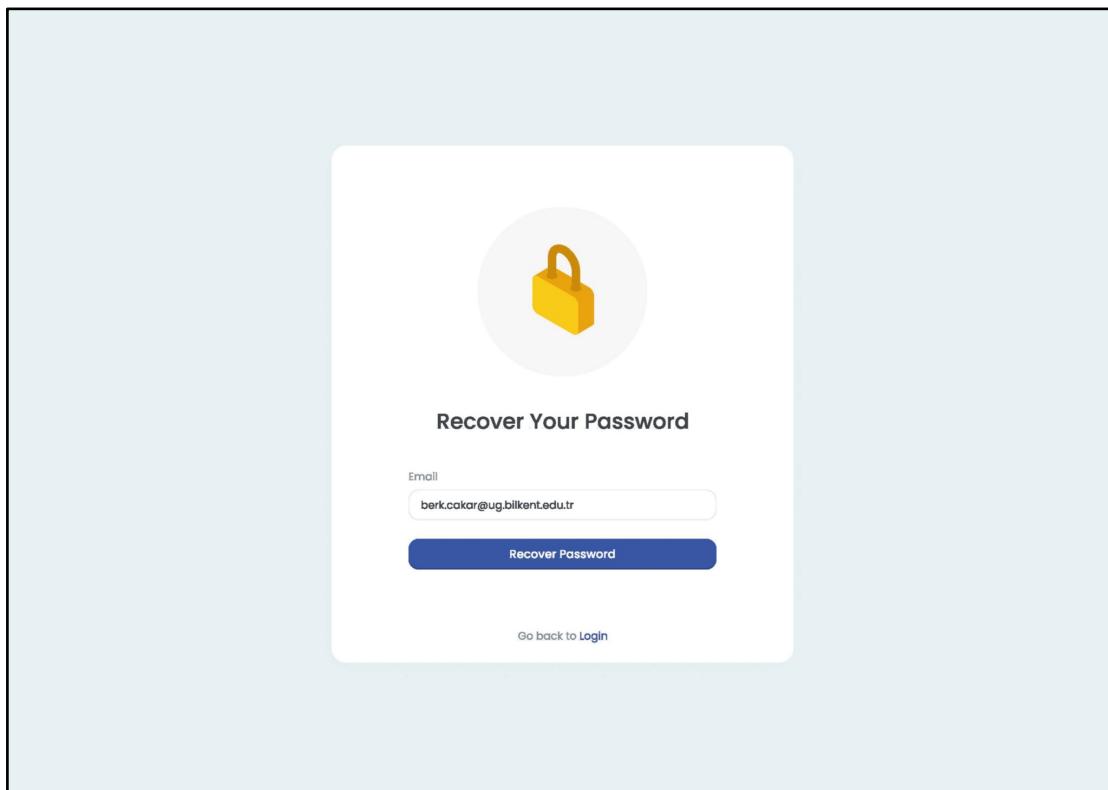


Figure 13: Forgot Password Screen of ERSMS

3.5.4.2 Exchange Coordinator Dashboard Screen

A screenshot of the Exchange Coordinator Dashboard. The dashboard is divided into several sections:
 - **Left Sidebar:** Labeled 'ERSMS' and 'Dashboard'. Other menu items include 'Forms and Requests', 'Logging', 'Placements', and 'Messages' (with a red notification badge).
 - **Main Content Area:**
 - **Course Equivalence Requests:** A donut chart showing 21 Processing, 10 Rejected, and 20 Approved requests.
 - **Submitted Pre-Approval Forms:** A bar chart showing the total submitted forms per day of the week. The values are: Monday (M) ~10, Tuesday (T) ~15, Wednesday (W) ~10, Thursday (T) ~25, Friday (F) ~5, Saturday (S) ~5, Sunday (S) ~5. A note indicates 'Total Submitted Current Week' is 32.
 - **To-Do List:** A list of tasks for students:
 - Student: Kutay Tire [22001787] - Check student's pre-approval form.
 - Student: Borga Haktan Bilen [22002733] - Meeting with the student at 15:30.
 - Student: Berk Çakar [22003021] - Check student's course equivalence request.
 - Student: Yiğit Yalın [22002178] - Check student's pre-approval form.
 - **Recent Activity:** A log of system events:
 - 12 September:
 - User B (Berk Çakar) added a new pre-approval form.
 - User B (Borga Haktan Bilen) updated a pre-approval form.
 - User K (Kutay Tire) added a new course equivalence request.
 - User E (Eray Tüzün) approved a course equivalence request.
 - 16 September:
 - User A (Atak Talay Yücel) registered to the system 2 min ago.
 - User B (Berk Çakar) added a new course equivalence request 35 min ago.
 - User S (Selim Aksøy) approved a CTE form 1 hour 40 min ago.
 - User C (Can Alkan) added a new announcement 2 hours ago.
 - **User Profile:** Shows 'Can Alkan' as the Exchange Coordinator.

Figure 14: Exchange Coordinator Dashboard Screen of ERSMS

3.5.4.3 Exchange Coordinator Forms Screen

The screenshot shows the Exchange Coordinator Forms Screen of ERSMS. The interface is organized into several sections:

- Left Sidebar:** Contains links for Dashboard, Forms and Requests (selected), Logging, Placements, and Messages.
- Active Forms Section:** Displays three active forms:
 - Berk Çakar's Pre-Approval Form:** Exchange School: Kingston University. Courses listed: CE321 <-> CS319, PHIL23 <-> HUM111.
 - Borga Haktan Bilen's Pre-Approval Form:** Exchange School: AGH. Courses listed: CNG375 <-> CS315, EN323 <-> ENG401.
 - Ahmet Veli's CTE Form:** Exchange School: Vrije University. Courses listed: CMPE426 [Grade: B] <-> CS476, MATH155 [Grade: A-] <-> MATH230.
- Recent Activity Section:** Shows a timeline of events from September 12 to September 16, 2022, involving users A, B, C, D, E, and K.

Figure 15: Exchange Coordinator Forms Screen of ERSMS

The screenshot shows the Exchange Coordinator Form Details Screen of ERSMS, focusing on a specific pre-approval form:

- Form Details:** Shows the form number (#790841) and the student's name (Berk Çakar).
- Student Information:** Includes fields for Name, Email, Bilkent ID Number, and Exchange Status.
- Student Summary:** Lists the student's department (Computer Engineering), COPA (3.62), and entrance year (2020).
- Exchange Summary:** Lists the exchange program (ERASMUS), exchange school (Kingston University), and term (2022-2023 Spring).
- Approval:** Shows the approval status (Waiting for Approval) and details about the approver (Name: Can Alkan, Role: Exchange Coordinator, Date: Form is not approved yet).
- Export Options:** A modal window is open, showing options to Export (Excel, PDF, etc.) and Print the form.

Figure 16: Exchange Coordinator Form Details Screen of ERSMS

3.5.4.4 Logging Screen

The screenshot shows the ERSMS interface with the 'Logging' tab selected in the sidebar. The main area is titled 'Logging' and displays a table of course equivalence requests. The columns include ID, STUDENT, DATE, TYPE, SCHOOL, and STATUS. The table shows several entries, each with a checkbox, student name, date, request type, school, and status (e.g., Approved, Processing, Rejected). A search bar at the top allows filtering by log ID.

ID	STUDENT	DATE	TYPE	SCHOOL	STATUS
#159930	Berk Çakar	16.09.22	C. EQV. REQUEST CS319	KINGSTON UNI	Approved
#339955	Borga Haktan Bilen	12.09.22	PRE-APPROVAL FORM	AGH	Approved
#328785	Kutay Tire	12.09.22	PRE-APPROVAL FORM	EPFL	Approved
#835458	Yiğit Yalın	12.09.22	PRE-APPROVAL FORM	KTH	Processing
#790841	Ahmet Veli	08.09.22	CTE FORM	VRIJE UNI	Approved
#827149	Atak Talay Yücel	06.09.22	C. EQV. REQUEST CS315	SAARLAND UNI	Processing
#0886573	Mert Can	01.09.22	CTE FORM	TU DORTMUND	Rejected
#125410	İlker Kartal	01.09.22	CTE FORM	MALMO UNI	Approved

Figure 17: Logging Screen of ERSMS

Note that this screen is from an exchange coordinator's perspective, but still for the other actors it will be a variant of this screen. For example, for the students only the "Course Equivalence Requests" tab will be visible with students' names hidden.

3.5.4.5 Placements Screen

The screenshot shows the ERSMS interface with the 'Placements' tab selected in the sidebar. The main area is titled 'Placements' and displays a table of student placements. The columns include NAME, EMAIL, PREFERENCES, and SCORE. The table shows several entries, each with a student icon, name, email, preferences, and score. A search bar at the top allows filtering by student name. To the right of the table, there is a detailed view for student 'Eda Orta' with sections for INFO, GPA, Bilkent ID, Department, and Preferred Term.

NAME	EMAIL	PREFERENCES	SCORE
Eda Orta CS	foo@ug.bilkent.edu.tr	EPFL, Kingston	99.33
Ahmet Gökhan Örs CS	bar@ug.bilkent.edu.tr	Vrije, EPFL, Saarland	93.67
Eren Aktuğ CS	foo@ug.bilkent.edu.tr	EPFL, Saarland, TU Berlin	87.66
Bahar Coşkun CS	bar@ug.bilkent.edu.tr	Roskilde, EPFL, Saarland	82.00
Enes Olgen CS	foo@ug.bilkent.edu.tr	EPFL, Kingston, TU Berlin	77.33
Cevahir Karadiken CS	bar@ug.bilkent.edu.tr	Bamberg, ESIEE Paris	71.00
Rüştü Güralta CS	foo@ug.bilkent.edu.tr	Roskilde, EPFL, Saarland	69.33
Selin Bostancı CS	bar@ug.bilkent.edu.tr	TU Dortmund, Vrije	66.00
Okan Tanır CS	foo@ug.bilkent.edu.tr	EPFL, AGH, Kingston	62.67
Neval Alpay CS	bar@ug.bilkent.edu.tr	AGH, EPFL, Vrije	57.33

Figure 18: Placements Screen of ERSMS

3.5.4.6 Messages Screen

The screenshot shows the ERSMS application interface. On the left is a sidebar with navigation links: Dashboard, Forms and Requests, Logging, Placements, and Messages (which is selected, indicated by a red badge with the number 2). The main area has a header with a search bar and user profile for 'Can Alkan'. Below the header, there's a 'PEOPLE' section with a list of users: Berk Çakar (with a message 'Hello Berk, can you please update ...') and Borga Haktan Bilen (with a message 'Hocam can we meet at 18.30 tod...'). The main content area shows a conversation between Berk Çakar and Borga Haktan Bilen. Berk Çakar sent a message 'Hocam can we meet at 18.30 today?' 30 minutes ago. Borga Haktan Bilen responded with 'See you there' 1 minute ago. A text input field 'Type a message here...' is at the bottom, and a blue send button is visible.

Figure 19: Messages Screen of ERSMS

3.5.4.7 Instructor/Course Coordinator Course Equivalence Requests Screen

The screenshot shows the ERSMS application interface for course equivalence requests. The sidebar includes: Dashboard, Forms and Requests, Logging, and Messages (selected, with a red badge of 2). The main area displays two course equivalence requests:

- Berk Çakar's Course Equivalence Request** (12 September, 2022):
 - Exchange School: Kingston University
 - Courses: CE321 <-> CS319
 - Request Summary: Course at the Exchange School: CE321, Course at the Bilkent University: CS319, Syllabus: [Click Here](#), Did This Course Accepted as Equivalent Before: No
 - Your Comments & Extra Notes: Type something
 - Action buttons: Reject (red) and Accept (green)
- Borga Haktan Bilen's Course Equivalence Request** (12 June, 2020):
 - Exchange School: AGH
 - Courses: CNG354 <-> CS319

Figure 20: Course Equivalence Request Decision Screen of ERSMS

3.5.4.8 Profile Screen

The screenshot shows the ERSMS profile screen for a student named Berk Çakar. The top navigation bar includes links for Dashboard, Forms and Requests, Logging, and Messages (with 2 notifications). The main area displays the student's profile card with a large blue letter 'B' icon, name 'Berk Çakar', degree 'Computer Engineering', email 'berk.cakar@ug.bilkent.edu.tr', application status 'Pre-Approval Form Approved', Bilkent ID number '22003021', and exchange school 'Kingston University'. Below the profile card, there are sections for 'Other Students Going to Kingston University' and an 'Information Card'.

Information Card	
Name Surname	Berk Çakar
Bilkent ID Number	22003021
Email	berk.cakar@ug.bilkent.edu.tr
Entrance Year	2020
CGPA	3.82
Preferred Term	2022-2023 Spring
Exchange School Preferences	EPFL, Kingston University, TU Berlin
Placed Exchange School	Kingston University
Extra Language Proficiency	German - B1

Figure 21: Profile Screen of ERSMS

3.5.4.9 Student Dashboard Screen

The screenshot shows the ERSMS Student Dashboard and Notifications screen. The left sidebar lists 'Dashboard', 'Forms and Requests', 'Logging', and 'Messages' (with 2 notifications). The main dashboard area features a 'To-Do List' with items like '[Optional] Request for Course Equivalence' and 'Submit Pre-Approval Form'. To the right, a 'Notifications' panel displays messages from Borga Haktan Bilen and Can Alkan, along with a notification about the pre-approval form being approved.

Figure 22: Student Dashboard and Notifications Screen of ERSMS

3.5.4.10 Student Form Submission Screen

Forms

Submit Pre-Approval Form

Submit Other Form

FORM TYPE	ID	DATE	STATUS
Pre-Approval Form	#790841	12.09.22	Approved
Other Form	#439502	04.09.22	Rejected

Figure 23: Student Form Submission Screen of ERSMS

Submit Pre-Approval Form

COURSE LIST

Host Institution Courses

Group 1 + Add Course

Course Code	Course Name	Credits
INF4032	Computer Networks	3.0
INF4032	System Programming	2.0

Mandatory

Technical Elective

Social Science Elective

Arts Elective

General Elective

Additional Course

Equivalent Course Type **Equivalent Course Code (if any)** **Credits**

Additional Course CS 421 3

Equivalent Course Type **Equivalent Course Code (if any)** **Credits**

Additional Course Initiation to Challenges 1.0

Equivalent Course Type **Equivalent Course Code (if any)** **Credits**

Additional Course Initiation to French Language a... 2.0

Submit Form **Cancel** **+ Add Group**

Figure 24: Pre-Approval Form Submission Screen of ERSMS

3.5.4.11 OISEP Score Table Upload Screen

The screenshot shows the 'Exchange Score Tables' section of the ERSMS application. At the top, there are three main buttons: 'Upload Score Table' with an upward arrow icon, 'Delete Score Table' with a red X icon, and 'Download Score Table' with a downward arrow icon. Below these buttons is a search bar labeled 'Search students...' and an 'Actions' dropdown menu. The main area displays a table of student data with the following columns: NAME, EMAIL, PREFERENCES, and SCORE. The table contains 10 rows of data, each with a small circular profile icon and initials (e.g., E, A, B, C, R, S, O, N) next to the name. The data is as follows:

NAME	EMAIL	PREFERENCES	SCORE
Eda Orta CS	foo@ug.bilkent.edu.tr	EPFL, Kingston	99.33
Ahmet Gökhan Örs CS	bar@ug.bilkent.edu.tr	Vrije, EPFL, Saarland	93.67
Eren Aktuğ CS	foo@ug.bilkent.edu.tr	EPFL, Saarland, TU Berlin	87.66
Bahar Coşkun CS	bar@ug.bilkent.edu.tr	Roskilde, EPFL, Saarland	82.00
Enes Olgen CS	foo@ug.bilkent.edu.tr	EPFL, Kingston, TU Berlin	77.33
Cevahir Karadiken CS	bar@ug.bilkent.edu.tr	Bamberg, ESIEE Paris	71.00
Rüştü Gürata CS	foo@ug.bilkent.edu.tr	Roskilde, EPFL, Saarland	69.33
Selin Bostancı CS	bar@ug.bilkent.edu.tr	TU Dortmund, Vrije	66.00
Okan Tanır CS	foo@ug.bilkent.edu.tr	EPFL, AGH, Kingston	62.67
Neval Alpay CS	bar@ug.bilkent.edu.tr	AGH, EPFL, Vrije	57.33

At the bottom left, there is a dropdown menu showing '10' and a message 'Showing 1 - 10 of 100'. At the bottom right, there are navigation icons for page numbers 1, 2, 3, ..., 5, >, and >>.

Figure 25: OISEP Score Table Upload Screen of ERSMS

4 Improvement Summary

In the second iteration of the analysis report, necessary adjustments were made to correct some mistakes in the diagrams and explanations. First of all, functional requirements were expanded to cover the roles of the users. Furthermore, the non-functional requirements made testable and quantitative. For the diagrams, all use-cases were checked and readjusted so that they all start with a verb. The redundant parts of the activity diagrams were also omitted. For the state diagrams, more cases were covered and the diagrams were elaborated to cover also reevaluations by the exchange coordinators. The number of sequence diagrams was reduced to one as requested and the lacking methods in the sequence diagram were also added to the class diagram.

Furthermore, the class diagram was reedited. Many of the features in the profile classes were transferred to the corresponding user types to make it more understandable. The class diagram was also made similar to the entity class diagram in the design report. For example, the lacking Announcement and Appointment classes were added and their necessary methods were also added in the corresponding user classes. Finally, the PrivilegedUser class was omitted as the design was too complicated with it. The class diagram was made compact and easy to read.

5 References

- [1] Object-Oriented Software Engineering, Using UML, Patterns, and Java, 2nd Edition, by Bernd Bruegge and Allen H. Dutoit, Prentice-Hall, 2004, ISBN: 0-13-047110-0.