Bilkent University Department of Computer Engineering



CS319 Term Project

Section 3
Group 3D
Erasmus++

Project Analysis Report

Group Members

- -Yunus Eren Türkeri (22001842)
- -Ender Utlu (22001983)
- -Ege Ayan (22002478)
- -Alp Ertan (22003912)
- -Mehmet Feyyaz Küçük (22003550)

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1. Introduction

As group 3D, our aim is to build a thorough system for Erasmus+ Mobility Program application. It serves as a platform where the candidates (students/applicants) may apply to mobility programs with the eased process steps. Though the candidates are the main audience for application, coordinators, departmental exchange coordinators, administrators will also be able to use this system that will ensure practicality for the application process.

The main objectives of the application are posting announcements, viewing the roadmap and easy application process to Erasmus+ programs. These features focus on making the application process and its management easier for both candidate and coordinator sides. The main feature for this *ease-of-use* is that the interaction between the course coordinators and the candidates are much faster such that not all the process steps are on e-mail or paper, rather the use of paper and e-mails are aimed to be decreased with the aforementioned system's features.

1.1 Application Features

- Profile Management including customization of password, profile picture, email,
 phone number, date of birth, gender, about me)
- Uploading Application Documents (and required documents such as Learning Agreement, Pre-approval Form, Official Dates Form, etc.)
- Course Selection
- To-Do List coordinators
- Road-map for candidates
- Posting announcements (administrators, coordinators will post important announcements through the system). Approved/rejected courses will be logged here for further students and coordinators to see.
- Faculty Administration Board decisions will be logged (for both-pre approval and credit transfer).

2. Proposed System

2.1 Functional Requirements

The program has three types of users which are

- Candidates
- Coordinators
- Administrators
- Faculty Administration Board
- International Students Office
- Host University Representative

2.1.1 Login Page

Login page will consist of an email field and a password field for users to enter their login information along with a login button which will terminate the login operation with given parameters (email and password). There will also be a forget password button in case if the user has forgotten his/her password. There will be different types of accounts depending on their level of access such as candidate account, department coordinator account, and admin account.

2.1.2 Profile Page

The profile will contain email, name, phone number, date of birth, gender, about me, and etc. Some of this information will be filled out for the users. But the users need to fill out the rest. Users will be able to update their profile picture and password.

2.1.3 My Applications

If the users are eligible for Erasmus (CGPA >= 2.5), they will be able to apply to any of these programs during the application period. Users will have to fill in the necessary boxes including credentials and choice of universities for the application form. Automatic application form will be formed inside the system via fetching the candidate data in the pre-filled boxes. The students will be able to request the ready application form by pressing the "export pdf" button. Statement of Purpose For Erasmus file can be uploaded as pdf format to the application system. Candidates who completed their application will be added to the respective department coordinator's TODO List as "Approved". After that, the candidate can continue with the rest of their application.

2.1.4 To-Do List

To- Do list is only visible to department coordinators. To- Do list will make it easier for the coordinator to see at which stage the candidate is at. They will be able to perform various actions depending on the candidate's stage.

2.1.5 Roadmap

Since the applying phase can be complicated, each candidate will have a roadmap to guide them through that application. When a candidate applies for a program, the respective coordinator will be able to view their roadmap. Roadmap might contain steps such as "Fill out the application form", "Upload a Statement of Purpose", etc.

2.1.6 Announcements

One of the biggest problems of the current Erasmus system is lack of communication between candidates and coordinators. Since it can be tedious for coordinators to communicate with every candidate, coordinators can post important announcements that will be visible to candidates. Announcements will also be sent to candidates via noreply mail.

2.2 Non-functional Requirements

2.2.1 User Friendly

Erasmus++ will have informative navigation bars that won't confuse the users. The system will also have query support, and a FAQ section. Also, it is important for the system UI to seem appealing to the users, for example, sharp contrast colors will not be chosen for the user interface. Furthermore, the system requires paper usage only when there is a sign of a user is needed; other fundamental processes won't require any paperwork.

2.2.2 Maintainable

The contemporary libraries and software languages will be used for the implementation, i.e. React v18.0, so that the maintenance for further development would be more efficient. Also,

the concept of object-oriented software engineering will be adopted as much as possible, to fix any occasional bugs and necessary updates.

2.2.3 Secure

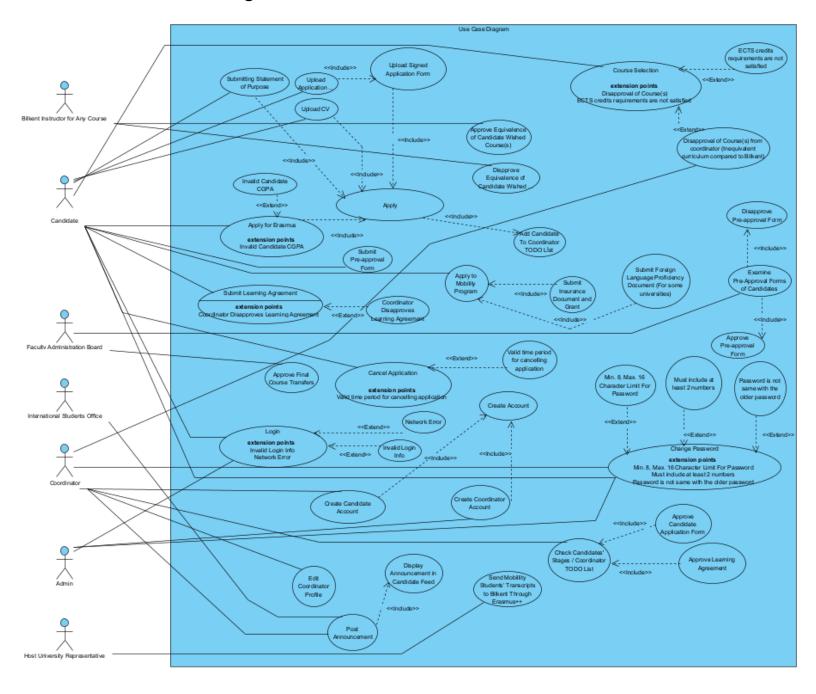
Admins will provide coordinators their own dedicated accounts & passwords at the beginning of each academic semester. This will ensure that no unauthorized user can log in to the system as a coordinator. Given that, the candidate accounts will also be created by the coordinators which ensures that anybody out of the domain will not have any access to the system.

2.2.4 Availability

The system will be open for users at a given point in time, unless a pre-announced maintenance break is needed. Note that this does not imply that the candidates will be able to apply mobility programs any time they wish to, the system availability is only for accessing and using the web-application.

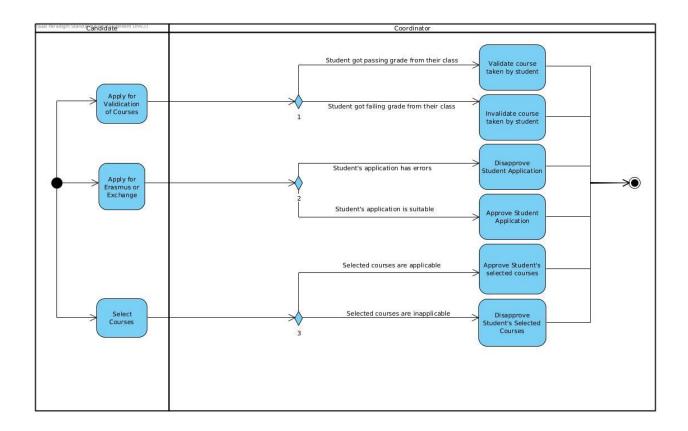
3.0 Dynamic Models

3.1 Use Case Diagram



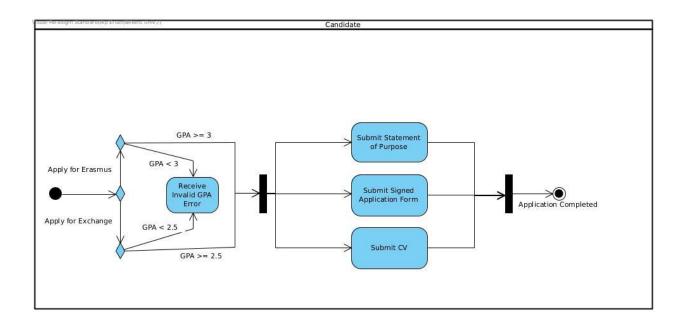
3.2 Activity Diagrams

3.2.1 Check Candidate State Activity Diagram



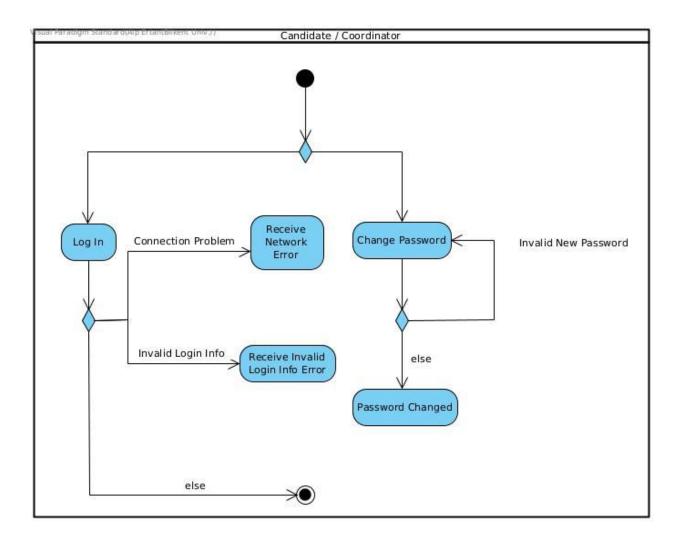
The dynamic between the candidate and the coordinator is based on three types of requests which are validation of courses, applying for Erasmus program and selecting courses. For course validation, the validation of the taken course will be done by the coordinator depending on if the student gets the passing grade or not. For the Erasmus application case, the two outcomes depend on if the application is valid or not. By investigating the application in terms of errors, the approval statement will be done on the coordinator side. Finally, for the course selection, the coordinator will be deciding if the selected courses are appropriate for the application or not and finally the request will be approved or disapproved.

3.2.2 Apply for Erasmus & Apply for Exchange Activity Diagram



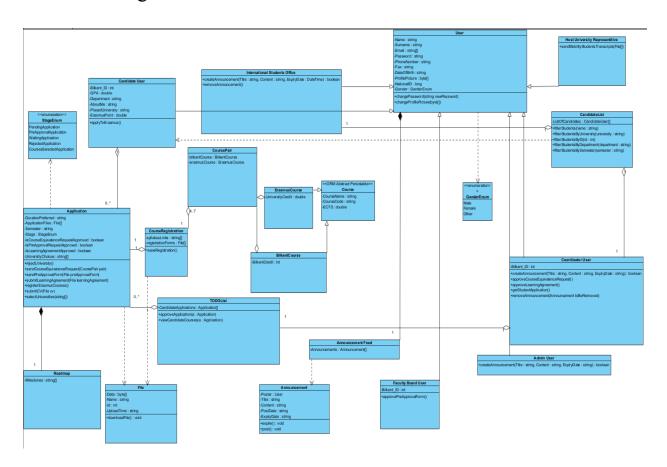
For the erasmus application, the first stage is to determine if the candidate has enough GPA (>= 2.5) in order to move to further stages. If the candidate fails to fulfill the GPA requirement, he/she will receive an invalid GPA error immediately. If the candidate has the required GPA limit, the candidate will have to submit his/her statement of purpose, application form and CV. In order to complete the application, all three of these forms must be uploaded to the system.

3.1.3 Login Process Activity Diagram



For the login and change password operations, both candidates and coordinators share the same activity diagram since the process is similar. If the user attempts to login, the attempt will either be successful or the user will face a login error. The first type of login error the user might face is the invalid login info such as username / password mismatch. The second type of login error is due to connection error in cases where the server is down or there is no internet connection. For the change password operation, the outcome will be decided on if the new password is invalid or not. If it is valid, the password change operation will be done successfully, if it is invalid, a valid new password will be requested from the candidate/coordinator.

3.3 Class Diagram



Above is the class diagram of Erasmus++ web-application. There are 13 classes in total to model keys, actors, events and functionalities in our applications.

User Class: This class is abstract, and used to model actors in a general form. CandidateUser, CoordinatorUser, AdminUser all inherit from this class to represent a specific actor in our design. The user class contains the credentials of the user.

GenderEnum Class: This is an enumerator for depicting the user's gender. More choices can be added if needed.

CandidateUser Class: This class represents the candidate actor (the user who will apply for Erasmus). Aside from the information coming from the abstract user class, CandidateUser class contains academic information such as ID, GPA, department, curriculum year, about me, and also the Erasmus application as well.

CoordinatorUser Class: This class represents the coordinator actor responsible for the candidate. Aside from the information from the user class, coordinators also have ID and

department. Coordinators can also create and post announcements for candidates associated with the coordinator's department.

AdminUser Class: This class represents the admin actor who will regulate and maintain the Erasmus++ application. The AdminUser class can also create and post announcements for everyone.

FacultyBoardUser Class: This class represents people from the faculty board. This type of user can create and post announcements for candidates and approve/disapprove pre-approval forms.

InternationalStudentsOfficeClass: This class represents people from the international office, they can give updates to candidates from the host university, or other general information about Erasmus. This type of user can create and post announcements for candidates.

HostUniversityRepresentitiveClass: This class represents the host university who will send mobility students' transcripts. They have their own password and user info as all other users.

Profile Class: This class represents the profile of the user. All the elements that are needed to display the profile page will be packed into this class. The Profile class also contains the functionalities changePassword, and changeProfilePicture.

Announcement Class: This class encapsulates the announcement that can be created and posted by coordinators and admins. Poster is the User who created the post. Announcement contains Title and Content inputs which need to be given by the creator of that announcement. PostDate is the time and date the announcement is published. ExpiryDate is the time and date the announcement will be removed or lose its importance when it is no longer relevant.

AnnouncementFeed Class: This class holds and displays the announcements to the relevant candidates. The Relevancy is determined by matching the department of the candidates and coordinators. Admins will create announcements for everyone (including coordinators).

File Class: File class is a template suitable for all file types we will store(pdf, txt, word etc.). Since we can store every file as a byte[], this class can represent all of our files. It has a name, upload time and a unique id. Its downloadFile function allows us to fetch it when we need to.

Stage Enum Class: It has 4 enumerator values for 4 different stages. It is used in all operations that need a stage info. The stages are numbered according to their real life order for logical correlation.

Roadmap Class: Roadmap class represents the milestones of the application process. Its milestones attribute stores the complete and uncomplete milestones in it. It is used by application classes to keep track of milestones. The markMilestone function marks the ith milestone as complete. The displayMilestones function displays the condition of all milestones.z"

Application Class: This is one of the main classes in our app. It has the following attributes:

- DurationPreferred : Represent preferred term for Erasmus
- ApplicationFiles[]: Stores the necessary files for the application process such as statement of purpose, application form and CV
- Semester: The applied semester to the Erasmus program
- Stage: Represents current stage with stageEnum
- IsCourseEquivalenceRequestApproved : Stores the approval of a course that is not in the previously accepted courses.
- IsLearningAgreementApproved : Stores the approval of the learning agreement document
- UniverstyChoices[] : Stores the university preferences

Using this info we can manipulate the application according to user inputs and exportApplicationForm() allows us to fetch the form whenever we want.

TODOList Class: It contains the candidate applications that are assigned to that coordinator. This class is instantiated per coordinator and each coordinator has a list of candidate applications to evaluate and respond. The approveApplication function allows us to approve the applications and the checkCandidateStage(int/string) functions allows us to query the student with the specific ID/name for the coordinator.

CourseRegistration Class: This class contains data for the whole course registration process from the courses themselves to pre-approval form

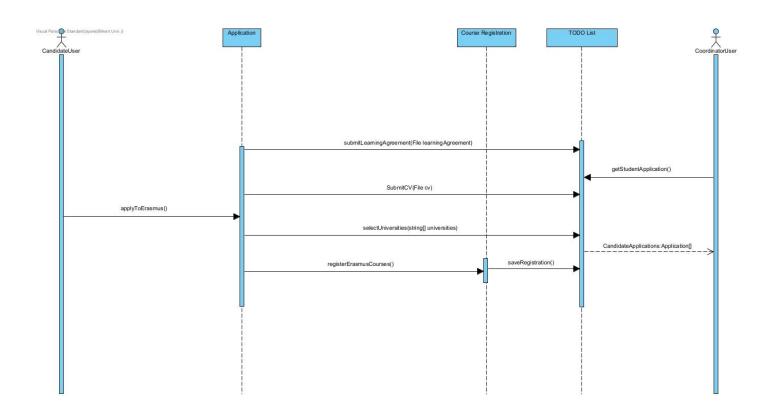
CoursePair Class: This class contains one course from each university which are similar to each other in terms of content (approved by coordinator and course instructors).

BilkentCourse Class: This class represents a course in Bilkent University. It contains the amount of credits the class has in the university. It is the child class of Course class.

ErasmusCourse Class: This class represents a course in the Erasmus University. It contains the amount of the credits the class has in the university. It is the child class of Course class.

Course Class: This is the parent class of Bilkent and Erasmus classes. It represents a standard course in a university. It contains course name, course code properties. It also contains the amount of ECTS credits the class has.

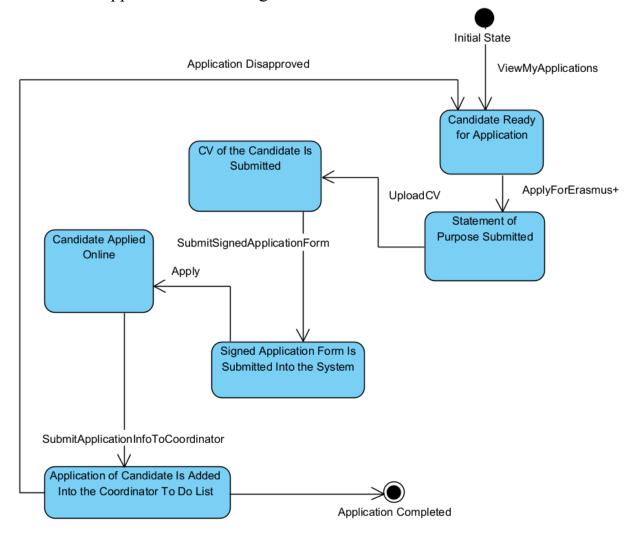
3.4 Sequence Diagram



Above is the sequence diagram for a simple Erasmus application request. The candidate user can use applyToErasmus function to apply. After that, the candidate should upload necessary forms, select universities and register Erasmus courses by the Application class. The Course Registration class is responsible for the selecting and saving of the courses. When these steps are completed, the coordinator user is able to view and approve the request through the TODO List class.

3.5 State Diagrams

3.5.1 Online Application State Diagram



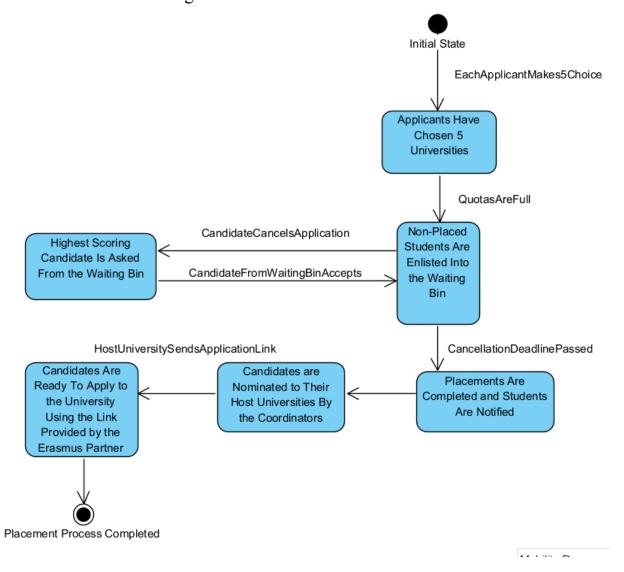
Initial State: A Candidate is to Apply for Erasmus+ Program.

Erasmus+ Program Application Initial State: Assuming that the semester is open for applications, for undergraduates, if a candidate has a minimum CGPA of 2.50 and currently in his/her minimum 3rd or maximum 5th registration semester, and for graduates if he/she is in his/her 1st semester and has a CGPA of 3.00 at the end of the semester, the candidate is eligible to submit their applications online in this state.

Candidate Applied Online: Candidates officially submitted all the required documents into the system, which are namely: statement of purpose, CV of candidates, signed application form.

Application of Candidate is Added into the Coordinator To Do List: The departmental exchange coordinator will either approve or disapprove the application of the candidate.

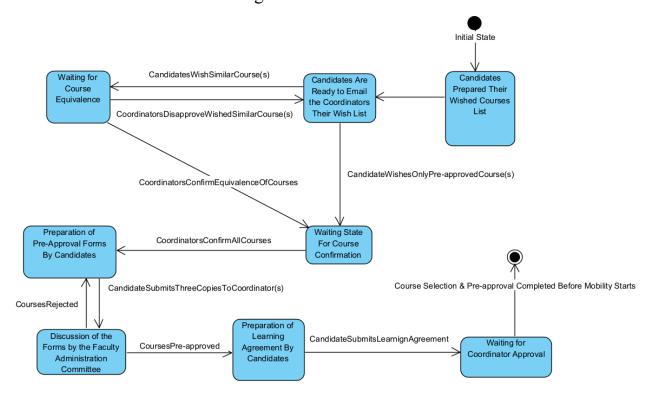
3.5.2 Placements State Diagram



Initial State: A student completed their application to the system and got approved by the departmental exchange coordinator.

Erasmus Placement Process: Top scoring student goes to first choice, quota for that university is decremented.

3.5.3 Course Selection State Diagram



Initial State: Course selection process begins after candidates are placed to host universities.

Candidates Make Wished Courses List: Outgoing students are required to observe previously accepted/rejected courses in their respective assigned host university, and make a list of courses they wish to take. Total credits must be at least 30 ECTS for Erasmus+ Program, and cannot exceed by much.

Candidates Email the Coordinators Their Wish List: The students email the coordinators for their wish list and link to the course web pages (including syllabus). If a candidate wishes courses that are all pre-approved, they go to the state of "Candidates Wait for Courses' Confirmation". If the candidate has any wished for a similar course, they go to "Candidates Ask for Equivalence" state.

Candidates Ask for Equivalence: In this state, coordinators either reject wished similar courses and ask for candidates to find new ones, or approve all similar courses. For must courses, candidates email the Bilkent instructor responsible of the said course and cc's the coordinators, send syllabus and ask for equivalence. For elective courses, candidates need to email coordinators with the syllabus of the said course.

Candidates Wait for Courses' Confirmation: In this state, candidates are to take courses that consist of pre-approved courses from past years, and recently confirmed similar courses (which

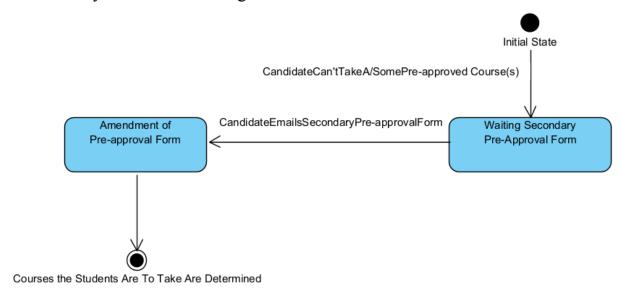
are asked for equivalence). The next state is then comes after candidates have all courses confirmed by the coordinators.

Candidates Prepare Pre-approval Form: Candidates prepare pre-approval form in typed, not handwritten (as such forms will be rejected).

Learning Agreement is Prepared By the Candidate: Learning Agreement includes the list of courses that are in the pre-approval form.

Coordinator Approval: Candidates submit the learning agreement for coordinator approval.

3.5.4 Mobility Process State Diagram

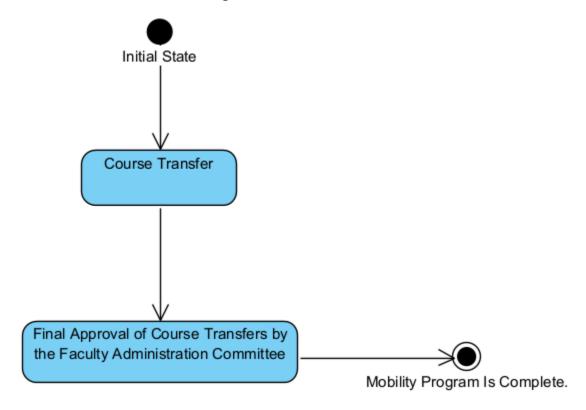


Initial State: Initial state is that mobility already started at the host institution and the pre-approved courses could not be taken due to schedule conflict or prerequisites.

Candidate Can't Take a/some Pre-approved Course(s): The candidates immediately email the coordinators and propose alternative courses.

Courses the Students Are To Take Are Determined: At this state, the courses that will be taken by the students are determined certainly.

3.5.5 Course Transfer State Diagram



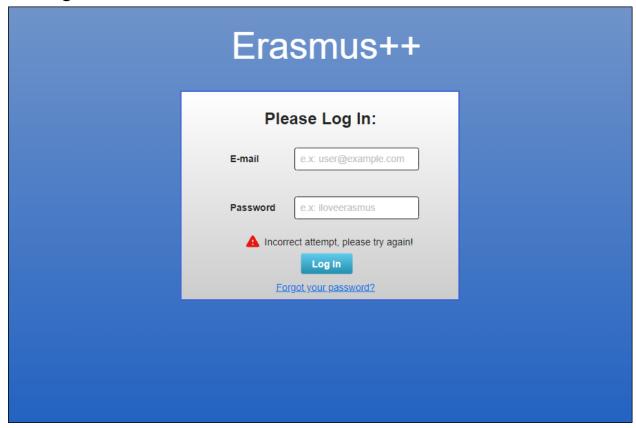
Initial State: At this state, the students have finished their studies.

Course Transfer Process Begins: The official transcript will be sent by the host organization to the Bilkent International Students Office, then forwarded to the coordinators. Then, the coordinators prepare the final course transfer form based on the official transcript and the pre-approval status of the courses.

Final Approval of Course Transfers by the Faculty Administration Committee: The coordinators submit the course transfer list to the Faculty Administration Committee for final approval. The Faculty Administration Committee sends the list of transferable courses to the student services.

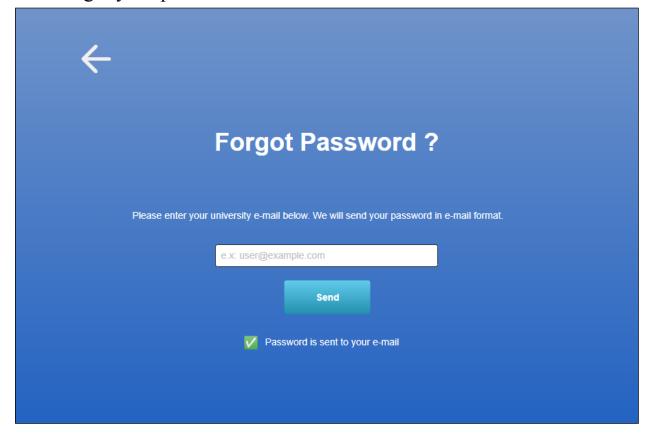
4.0 User Interface

4.1 Login Screen



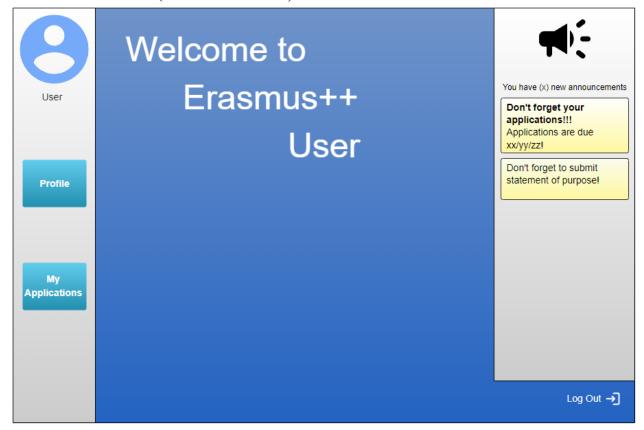
This is the login screen. There will be no different login screens for different actor (i.e. Candidate, Coordinator, Admin). An error message will appear in the case of an incorrect log in. If the users forget their password, they can click the "Forgot your password?" which will redirect them to a different screen.

4.2 "Forgot your password?" Screen



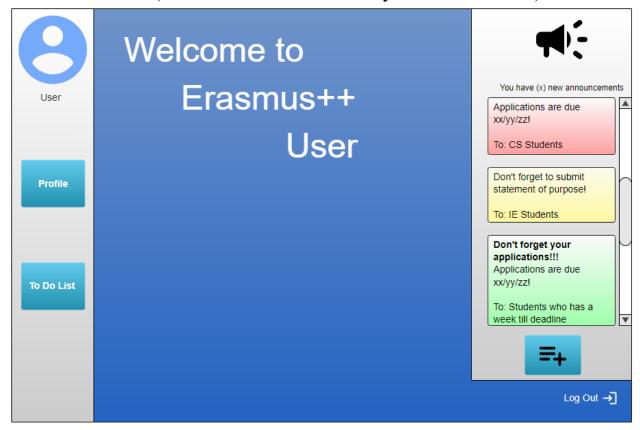
Clicking the "Forgot your password?" will redirect you to this screen. Here, you can acquire a new password by entering your registered e-mail.

4.3 Main Screen (For candidates)



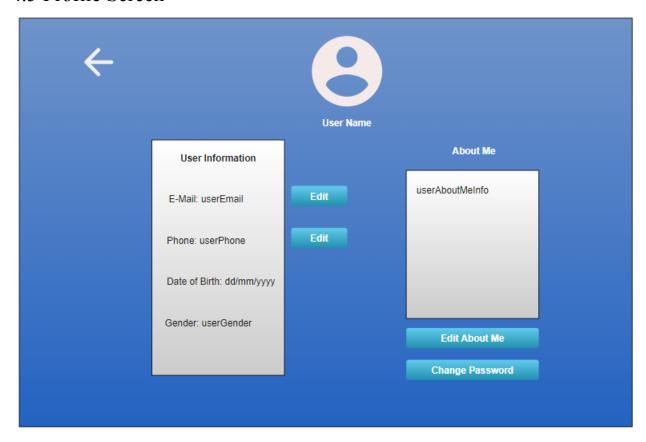
After successfully logging in, candidates will be redirected to this main screen. From here, candidates can logout back to the login screen. Enter their profile, Check out their application process on the left. And, they can view any announcement that they might have received on the right.

4.4 Main Screen (For coordinators & Faculty Board members)



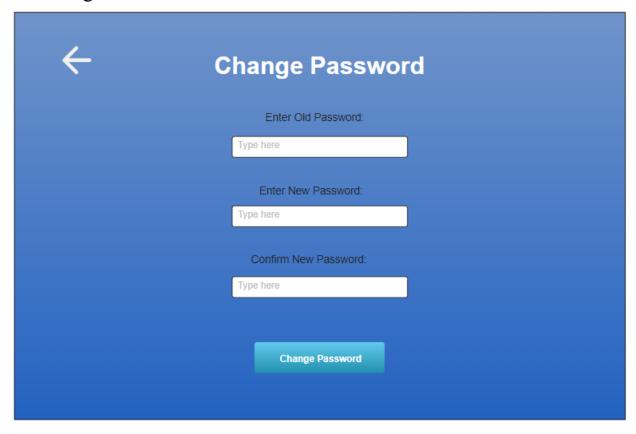
After successfully logging in, coordinators and faculty board members will be redirected to this main scene. From here, they can go to their Profile and To Do List from the left menu. From the right they can create new announcements for candidates.

4.5 Profile Screen



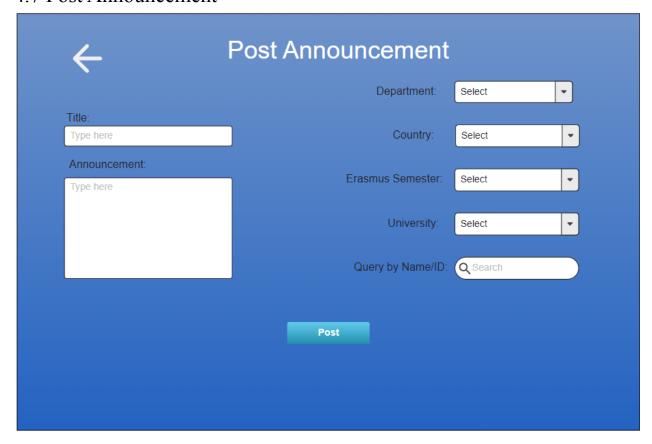
Profile screen provides the users to edit their personal information and "About Me" section. Also, they can change their password through this screen.

4.6 Change Password Screen



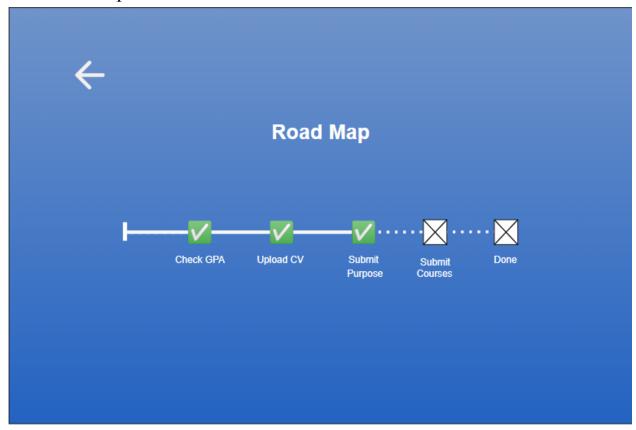
Users can change their passwords through this screen.

4.7 Post Announcement



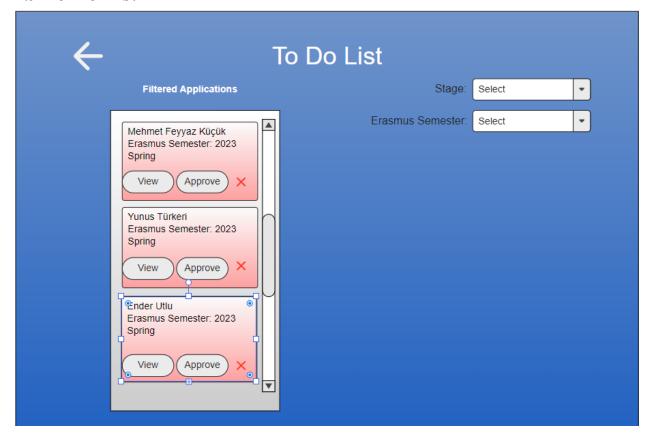
The coordinators can post announcements using this interface. There are 4 filters and a search by name option to filter down the candidates the announcement will arrive. If the announcement is for everyone no filter should be selected

4.8 Road Map



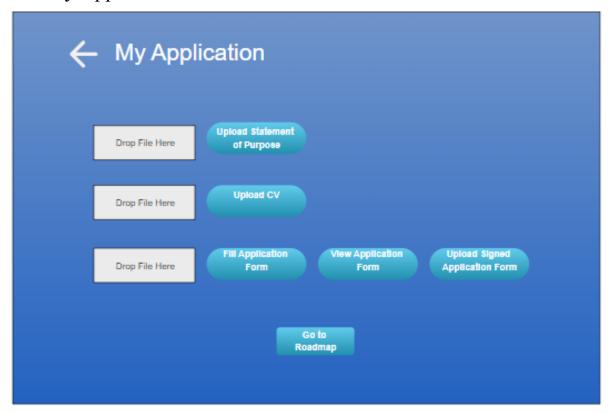
The candidates can follow their progress in the application process through the road map and see what they have to do next. This screen provides information about the work that must be completed by the candidate. This screen is reached, through the button in 4.10 My Application View.

4.9 To Do List



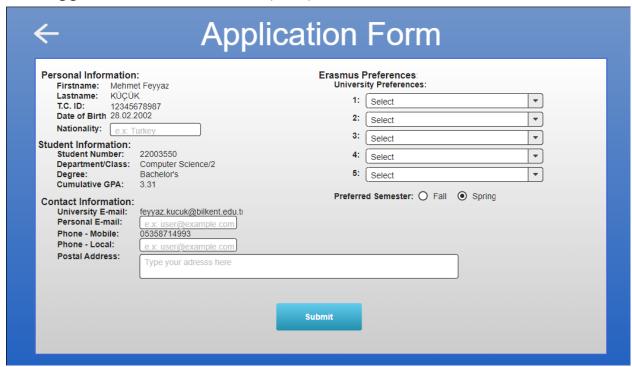
Coordinators approve using this interface. They can filter the students that are at a higher priority and inspect them accordingly.

4.10 My Application View



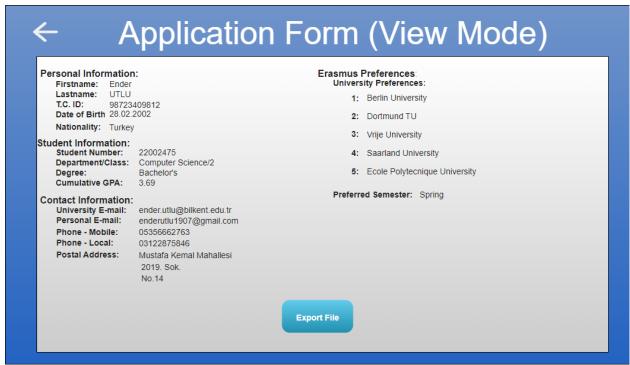
The students can upload a statement of purpose, and CV. Also, the students can click "Fill Application Form", view that filled form, and upload the signed version of that form. The roadmap screen view is available through the "Go to Roadmap" button.

4.11 Application Form Screen (Edit)



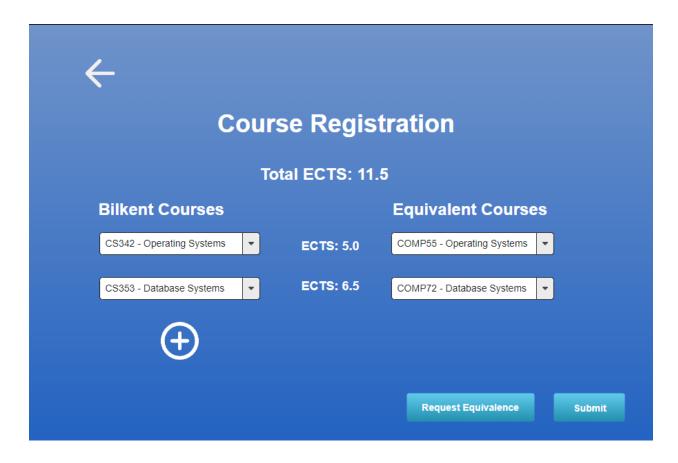
In this screen, candidates can fill out the application form needed for applying. Some of the information will be available already, so those parts will not be editable. Candidates need to fill out the information that the system does not have and their erasmus preferences.

4.12 Application Form Screen (View)



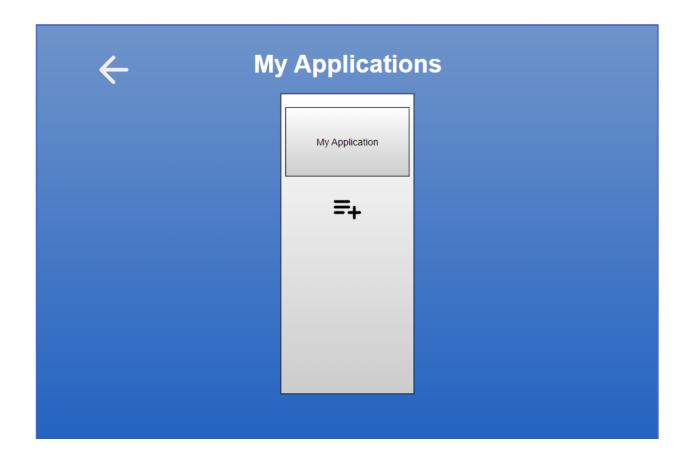
Coordinators and candidates can view this screen however they cannot edit it. Candidates can export this file as a pdf so that they can sign and upload it.

4.13 Course Registration Screen



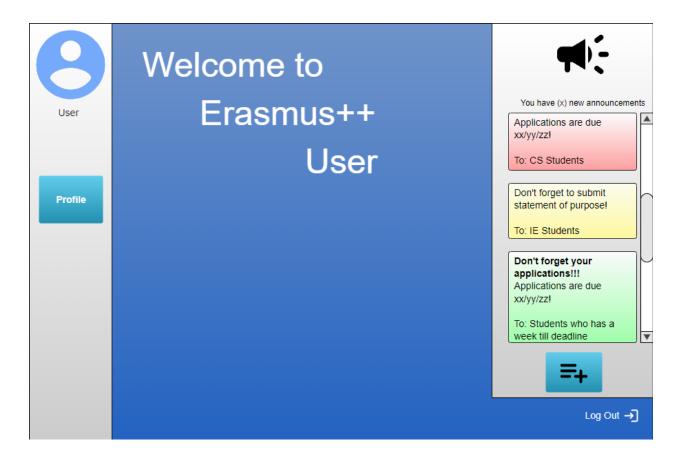
In the course registration screen, the candidates can select and add Bilkent courses along with equivalent courses. They can also see the ECTS of the courses and follow the total ECTS through that screen. They can also request course equivalence for the courses that are not in the previously accepted courses.

4.14 My Applications



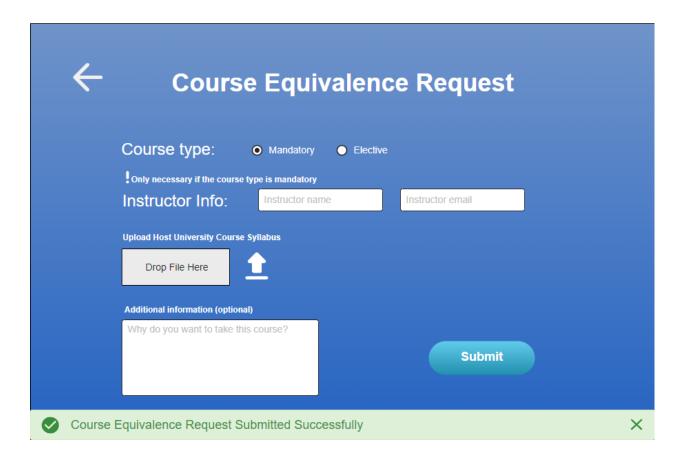
This interface will be used to create an application. It will be used by the candidates. Candidates will be able to see their applications and add more if they are allowed to.

4.15 Main Menu Screen (International Office)



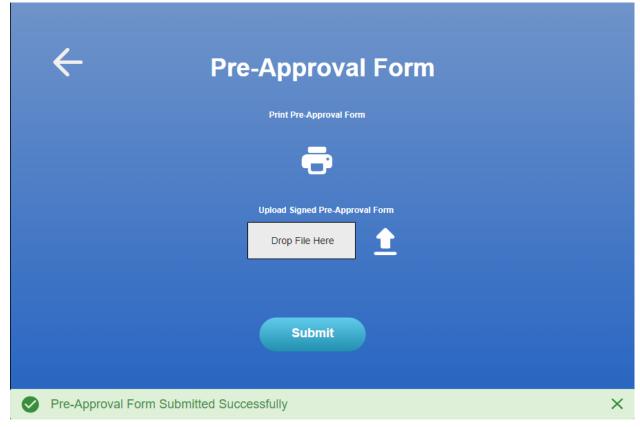
This is the main menu screen for the international office users. Its only difference from the coordinator main menu screen is the absence of the todo list button. International office users are only able to post announcements to candidates.

4.16 Course Equivalence Request Screen



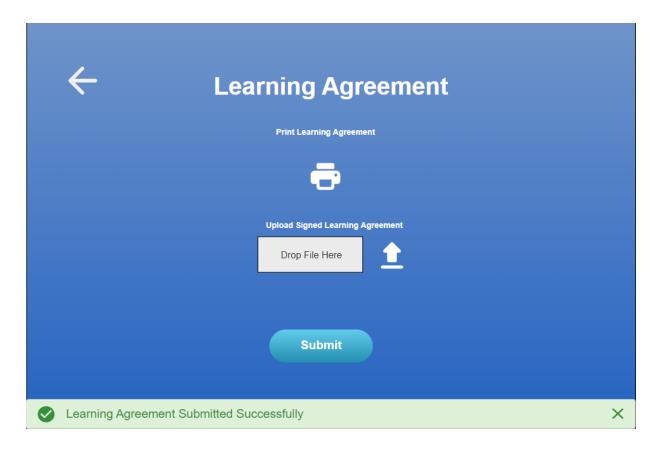
This is the screen the candidates get when they choose a course that is not in the previously accepted courses. Candidates must specify the course type (mandatory or elective). If the chosen course is mandatory, candidates must give the instructor's information for that course. If it is an elective course, such information is not needed. Finally, candidates can give additional information on why they want to take this course.

4.17 Pre-approval Print/Upload Screen



Candidates can download and print pre-approval form templates through this screen. After filling in the pre-approval form, the candidates hand the pre-approval form to the exchange coordinators for them to sign the form. After exchange coordinators sign the pre-approval form, the candidates can upload their filled pre-approval forms through this screen. Then, the pre-approval form is added into the To Do List of users at the Faculty Administration Board.

4.18 Learning Agreement Print/Upload Screen



Candidates can download and print learning agreements from this screen. After signing the learning agreement, they can upload their signed learning agreement through this screen again. After uploading their files, candidates can submit their learning agreements.