



Bilkent University

Department of Computer Engineering

CS319 Object-Oriented Software Engineering

Internship Management System

Project Final Report

Ahmet Alperen Yilmazyıldız 22002712
Ahmet Berke Gökmen 22002105
Erdem Eren Çağlar 22002359
Mahmut Mert Gençtürk 22003506

Instructor: Eray Tüzün

Teaching Assistant(s): Yahya Elnouby, Muhammad Umair Ahmed and Tolga Özgün

Final Report

May 29, 2023

This report is submitted to the Department of Computer Engineering of Bilkent University in partial fulfillment of the requirements of the CS319

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Project Final Report

Internship Management System

1 Introduction

As the outcome of our great efforts, we have successfully provided a functional internship management system that can go live with minor changes to its current situation. Our product covers all of the core features of the internship management system. It strictly differentiates the functionalities depending on the user's role & thoroughly controls any user interaction by both the front-end and the back-end to ensure that the application covers the maximum number of corner cases.

Our product, IMS, supports each step of the internship report evaluation cycle: The students can upload their internship report to the system and receive feedback from the assistants and evaluators. Assistants and evaluators can download the student internship reports & give feedback. Evaluators can additionally grade the submissions. Admin can initialize the semester by uploading an Excel sheet with user information & make arrangements such as changing the assignments of evaluators and assistants, marking student submissions as withdrawn or plagiarized, and changing the deadlines.

Due to time constraints, minor features are not implemented, such as FAQ and announcements pages. These features' back-end implementation is completed, yet because of unexpected breakups in the team, these particular pages were decided not to be given importance to provide the users with the core features.

2 Project Experience

As a group, we started as six people. As time passed, two teammates left, leaving us in a difficult situation. However, starting from day one, we had frequent group meetings with almost no delay. This allowed us to get things done quickly and not leave them to the last minute. Also, from day one, we have started the implementation of simple functionalities such as login, forgot password, etc., which immensely helped our development speed afterward.

Throughout the project, we learned to review our teammates' work in reports and pull requests. Both backend and frontend teams improved themselves in their fields with additional research and feedback from others. Our only negative experience was since we were implementing everything with four people, everybody had to take on extra responsibilities. Because of this, we have adopted state-of-the-art software development techniques such as the git-flow technique for pull requests and automatic code formatters to aid the development of features. Moreover, even though we constantly communicated, there were still two teams—one for the back-end and one for the front-end. Since verbal

communication is not always possible between the two, we have adopted automatic API documentation tools to aid the front-end development. The frontend team could work easier and faster without depending on the backend team.

One of the most important lessons that we have learned from this project is requirement analysis and elicitation. This project requires developing highly complex software with almost unlimited corner cases. Thus, not jumping into the code and researching beforehand to visualize and learn what we are building helped a lot during the implementation phase.

3 User Guide

3.1 Logging In




Figure 1: Login Page

To log in, users need to have a pre-created account in the Internship Management System. Then they need to enter their Bilkent ID and password correctly. Users' accounts (student, assistant, evaluator) are created automatically by the system admin. Users will receive an email containing their temporal password, which is created by the system automatically right after their account is created. When users log in to the system, they can change this password from the change my password option in the profile section. Users who successfully log in to the system are directed to the Dashboard page.

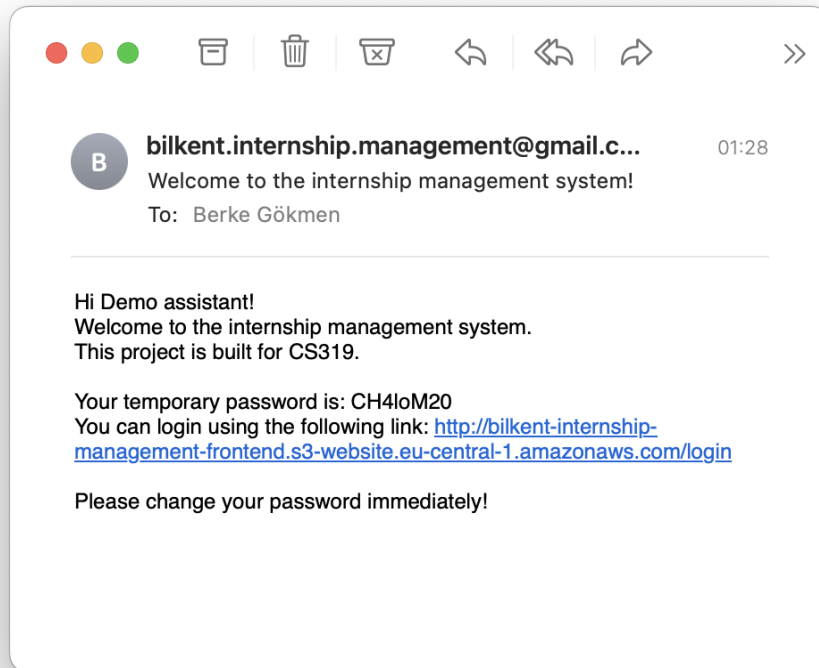


Figure 2: Example email that contains a temporary password

3.2 Creating User Accounts and Semesters & Editing Deadlines

The screenshot shows the 'Initialize Semester & Add Users' page. At the top, there's a navigation bar with 'JMS', 'DASHBOARD', 'ANNOUNCEMENTS', and 'FAQ'. A search bar and a user profile 'Begüm Çınar (ADMIN)' are on the right. The main content area is divided into three sections. The first section, 'Current Deadline Settings', shows 'First Submission Deadline (in days): 30', 'Last Edited By: Begüm Çınar', and 'Last Updated: May 28th 2023, 12:02:35 am'. The second section, 'Change Deadline Settings', has a 'Change first submission deadline (in days):' field with a 'Deadline...' input and a 'CHANGE' button. The third section, 'Create Semester', includes a 'CHOOSE FILE' button, 'Year', 'Semester', and 'Course' dropdowns, and a 'CREATE' button. Below this is the 'Add User' section with 'Name *', 'Mail *', 'Bilkent Id *', 'Role', and 'Semester' dropdowns, followed by a 'SUBMIT' button.

Figure 3: Admin's Initialize Semester Page

Admin can initialize the semester by uploading an Excel sheet with the user information (names, Bilkent IDs, emails, roles...) & choosing the year, semester, and course from the provided interface. The users in the uploaded Excel sheet will receive emails, including a welcome message and their default passwords. Admins can add users by providing the required user information through the provided interface as well. Admin can view & change the deadline configurations of the semester from this page.

3.3 Viewing Registered Semester

Students, evaluators, and assistants can view their registered semesters on the Dashboard page. Users can be registered for multiple semesters and courses at the same time. For example, if one user is registered into both the 2022-2023 Fall Semester CS299 and 2022-2023 Fall Semester CS399, they can see both semesters on their Dashboard page. Students will see the semesters in which they are required to make report submissions. Therefore, there is a "view submission" button in each registered semester which will be explained in section 3.4. Evaluators and assistants will see the semesters in that they will evaluate student reports. Therefore, in their registered semesters, they have an "evaluate submission" button, which will be explained in 3.5.

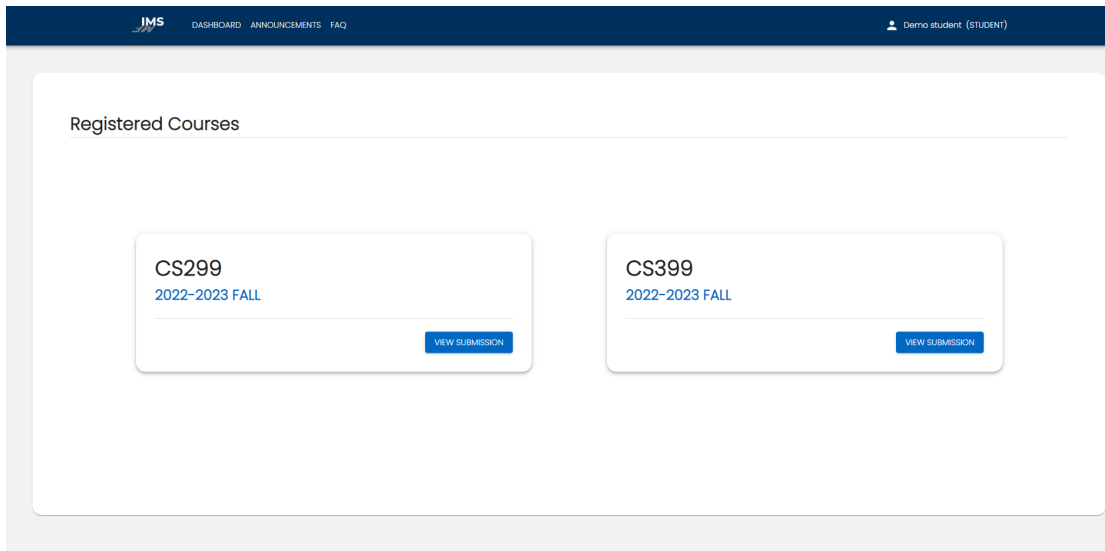


Figure 4: Student Dashboard that shows registered semesters

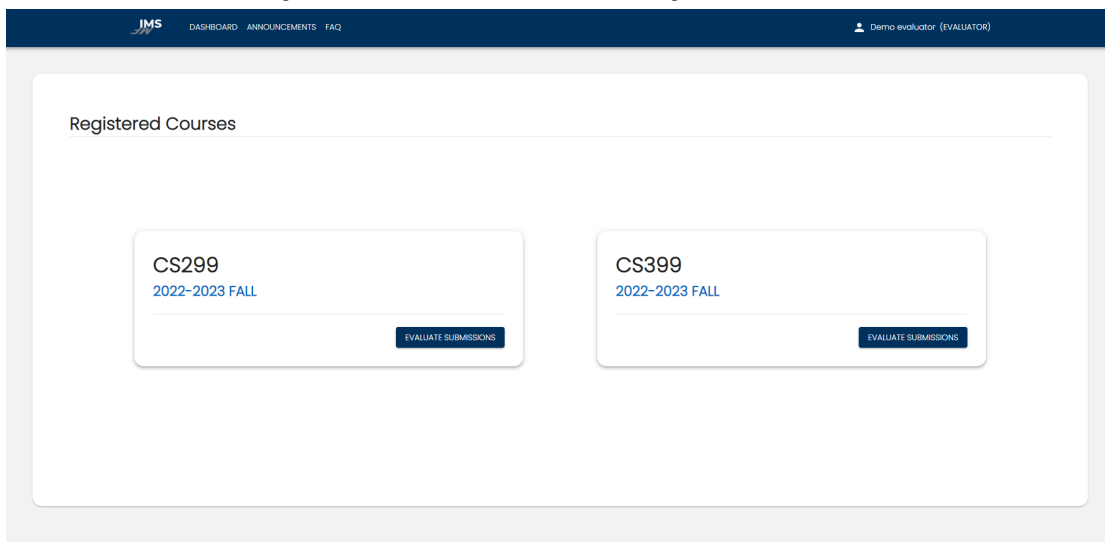


Figure 5: Evaluator/Assistant Dashboard that shows registered semesters

3.4 Viewing and Creating a Submission and Updating With a Revised Report

As mentioned in 3.3, in each semester part, there is a “view submission” button. When this button is clicked students can view the status of their submission on the pop-up screen. The pop-up screen is divided into three parts. In the upper part, students can view the current status of their report via the status bar and also can see whether a company evaluation form is uploaded or not. If the company evaluation form is not uploaded by the system admin yet, a red warning will emerge at the top of the pop-up screen. Also, once their report is graded by an evaluator, students can see which grade they got at the bottom of the status bar. In the middle part of the pop-up screen, there is a choose file button and a text field for entering comments. This part is for both creating a new submission and updating the current submission. Students can upload their internship report from here and add a comment to their submission. There is a

default message prepared for the first submission. Therefore, students do not need to enter specific comments for their first submission. However, if the evaluator or assistant requests changes from the student, then the student must write down what changes they made through this comment section. After they upload their report and write a comment for the report, they can click the submit button below the text field and send the submission to the assistant or evaluator, depending on the report state. In the bottom part of the pop-up screen, students can view the list of their old submissions and feedback from their assistants and evaluators under the "Old Reports and Old Feedback" title. When an evaluator or assistant requests changes to the report, their feedback and their annotated report PDF, if they have any, will be seen in the summarized version at the top of the "Old Reports and Old Feedback" section. By clicking the "view" button, students can see the feedback and download the annotated report.

CS299

✓

Create Submission

✓

Waiting Revision For Assistant

✓

Under Assistant Evaluation

✓

Waiting Revision For Evaluator

✓

Under Evaluator Evaluation

✓

Waiting To Be Graded By Evaluator

✓

Graded

Submission Result: SATISFACTORY

CHOOSE FILE

Add Comment to Your Submission *

Note! If this is your first submission, you can send this text as comment. However, on the next submission(s), if your TA or evaluator requested changes, you need to use this section to explain your changes that you made. Thus, please delete this section and add your own

SUBMIT

Old Reports And Feedbacks

From: Demo student	May 27th 2023, 1:31:37 am	VIEW
From: Demo evaluator	May 27th 2023, 1:31:23 am	VIEW
From: Demo student	May 27th 2023, 1:30:29 am	VIEW

Figure 6: Graded Submission Result

CS299

×

1

2

3

4

5

6

7

Create Submission

Waiting Revision For Assistant

Under Assistant Evaluation

Waiting Revision For Evaluator

Under Evaluator Evaluation

Waiting To Be Graded By Evaluator

Graded

CHOOSE FILE

Add Comment to Your Submission *

Note! If this is your first submission, you can send this text as comment. However, on the next submission(s), if your TA or evaluator requested changes, you need to use this section to explain your changes that you made. Thus, please delete this section and add your own comments.

SUBMIT

You need to upload your report by June 11th 2023

Old Reports And Feedbacks

From: Demo assistant

May 28th 2023, 12:34:55 am

VIEW

From: Alperen Yilmazyildiz

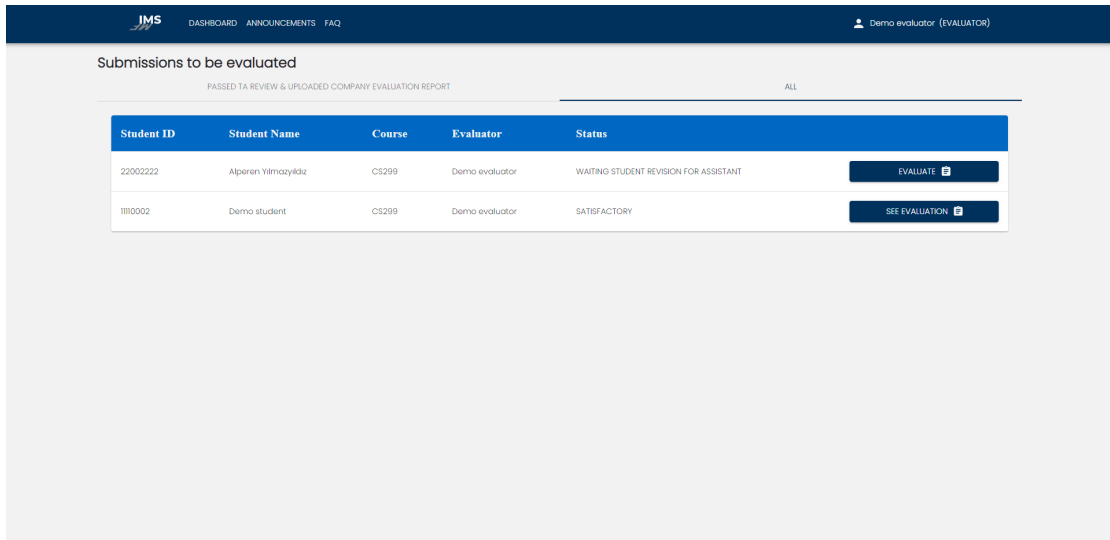
May 27th 2023, 10:39:59 pm

VIEW

Figure 7: Submission that required revision by assistant

3.5 Viewing Assigned Submissions

As mentioned in 3.3, in each semester part, there is an “evaluate submission” button on the assistant and evaluator Dashboard page. When the assistant and evaluator click these buttons, they are directed to the Assigned Submissions page. Assistants can see the list of submissions that are assigned to them. Evaluators can view all of the submissions that are assigned to them. At the same time, evaluators also have the option to view assignments that passed the assistant review and have a company report uploaded.



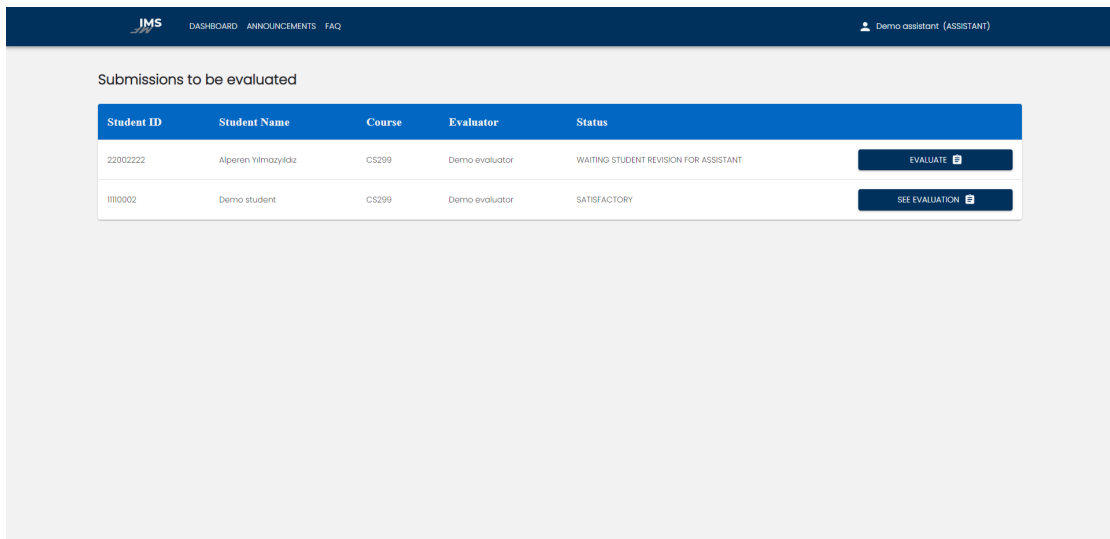
Submissions to be evaluated

PASSED TA REVIEW & UPLOADED COMPANY EVALUATION REPORT

ALL

Student ID	Student Name	Course	Evaluator	Status	
22002222	Alperen Yilmazyildiz	CS299	Demo evaluator	WAITING STUDENT REVISION FOR ASSISTANT	EVALUATE
11110002	Demo student	CS299	Demo evaluator	SATISFACTORY	SEE EVALUATION

Figure 8: Evaluator View Assigned Submission Page



Submissions to be evaluated

Student ID	Student Name	Course	Evaluator	Status	
22002222	Alperen Yilmazyildiz	CS299	Demo evaluator	WAITING STUDENT REVISION FOR ASSISTANT	EVALUATE
11110002	Demo student	CS299	Demo evaluator	SATISFACTORY	SEE EVALUATION

Figure 9: Assistant View Assigned Submission Page

3.6 Evaluating a Submission

In the Assigned Submissions page, when the assistant and evaluator click the "Evaluate" button, they are directed to the Evaluate page. On each Evaluate page, only one student submission can be evaluated. There is a student information section that contains student information like name, Bilkent ID, email, and course they are taking. In the "Evaluate Report" section of the same page, assistants and evaluators can download the latest student report and mark the student report as satisfactory or request changes. If they request changes, they must fill in the feedback section and if they prefer, they can upload an annotated PDF of the report. Lastly, they need to give a deadline for the revision. After this, they can send their request changes to the student. There is also a section for viewing old reports and feedback. Thus, evaluators and assistants can see the old versions of the report and the old feedback given to the students.

The screenshot shows the 'Evaluate' page in the IMS system. The top navigation bar includes 'IMS', 'DASHBOARD', 'ANNOUNCEMENTS', 'FAQ', and a user profile 'Demo evaluator (EVALUATOR)'. The main content area is titled 'Evaluate' and is divided into three sections. The first section, 'Student Information', displays details for 'Demo student': Name, Bilkent ID (1110002), Email (berke.gokmen@ug.bilkent.edu.tr), and Course (CS299). The second section, 'Evaluate Demo student's Internship Report', contains buttons for 'DOWNLOAD INTERNSHIP REPORT', 'SUBMISSION PDF', 'COMPANY EVALUATION REPORT', and 'VIEW/EDIT PART A GRADING'. Below these, a 'Satisfactory' status is shown with a 'VIEW/EDIT PART C GRADING' button. The third section, 'Old versions of Demo student's Internship Report', lists three previous versions with their respective dates and times, each with a 'VIEW' button.

Figure 10: Evaluate Submission Page

3.7 Grading a Submission

Only evaluators can grade the submissions. On the Evaluation page, when the evaluators mark the submission as satisfactory, the "Grade Part C" button will be available to the evaluators. When they click this button, a pop-up screen will be opened. In this screen, evaluators can fill up the form by entering evidence of desired criteria that they found on the report and grades of those criteria. When the company evaluation form is uploaded to the system, evaluators can also download this report and they can fill up the "Part A" section of the summer training evaluation form by clicking the "Grade Part A" button. After grading a submission, evaluators can download the PDF of the Summer Training Grade Form with the graded version and re-grade both parts by clicking the "View/Grade Part A" & "View/Grade Part C" buttons. If the student submission is marked as plagiarized or withdrawn, the evaluator can only view the grades of Part A & C.

Grade Part A

Student Name: Demo student

SEE COMPANY REPORT

Bilkent ID: 11110002

Questions

Average of the grades on the Summer Training Evaluation Form (Staj Değerlendirme Formu) filled by the employer
(Passing grade is 7)

Grade 10 /10

Is the work done related to computer engineering? [Y/N] ☒

Is the supervisor a computer engineer or has a similar engineering background? [Y/N] ☒

SUBMIT

Figure 11: Grade Part A Page

Grade Part C

Student Name: Demo student

Bilkent ID: 11110002

Questions

(1) Able to perform work at the level expected from a summer training in the area of computer engineering. (this is the evaluation of all the work done in the summer training) On what page(s) of the report is the evidence of this found?

List the pages * 12,13,14

(1) Able to perform work at the level expected from a summer training in the area of computer engineering. (this is the evaluation of all the work done in the summer training) Assessment/quality score

Grade * 3 /10

(2) Solves complex engineering problems by applying principles of engineering, science, and mathematics. On what page(s) of the report is the evidence of this found?

List the pages * 12,13,14, 15

(2) Solves complex engineering problems by applying principles of engineering, science, and mathematics. Assessment/quality score

Grade * 10 /10

(3) Recognizes ethical and professional responsibilities in engineering situations. On what page(s) of the report is the evidence of this found?

List the pages * 12,13,14

(3) Recognizes ethical and professional responsibilities in engineering situations. Assessment/quality score

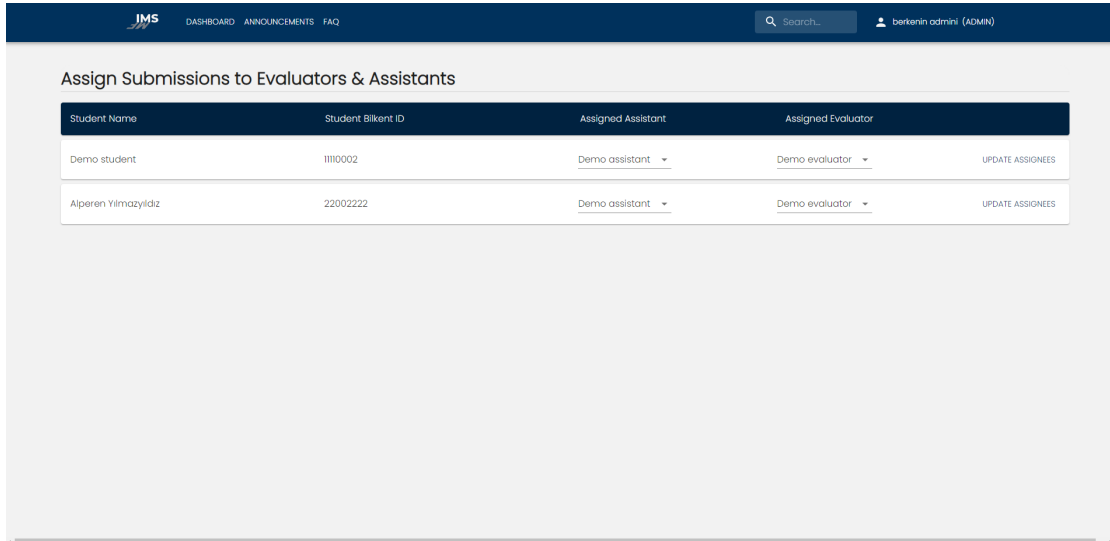
Grade * 10 /10

(4) Able to make informed judgments that consider the impact

Figure 12: Grade Part C Page

3.8 Assigning Submissions to Evaluators and Assistants

On the Admin Dashboard page, by selecting the semester from the left side of the dashboard screen and clicking the “Assign Submissions to Evaluators” button, the admin is directed to the Assign submission page where the registered students are listed for the chosen semester. Admin can assign assistants and evaluators to the students by choosing an assistant and evaluator corresponding sections. After choosing an assistant and evaluator, the admin can assign those assistants and evaluators to the student submission by clicking the “update assignees” button.



Student Name	Student Bilkent ID	Assigned Assistant	Assigned Evaluator	
Demo student	11110002	Demo assistant ▾	Demo evaluator ▾	UPDATE ASSIGNEES
Alperen Yilmazyildiz	22002222	Demo assistant ▾	Demo evaluator ▾	UPDATE ASSIGNEES

Figure 13: Assign Submission To Evaluators & Assistants Page

3.9 Exporting Grades and Statistics of a Semester

On the Admin Dashboard page, by clicking the “Statistics & Grades” button, the admin is directed to the export page. On the Export page, all of the semesters are listed. The admin can export the grades, statistics, and submissions and deactivate the semester by clicking the corresponding buttons.

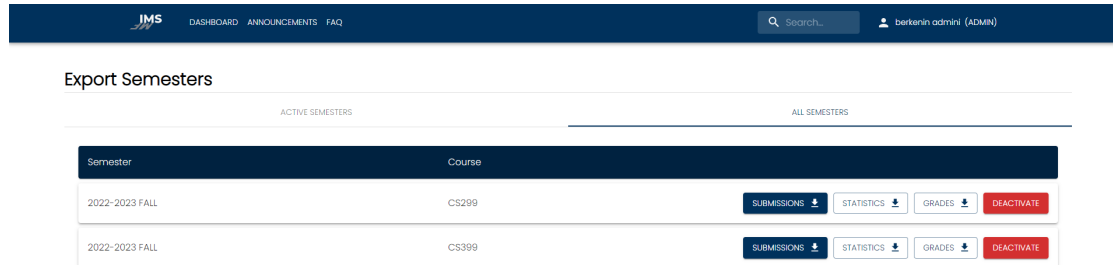


Figure 14: Export Page

3.10 Marking Submissions as Withdrawn or Plagiarised

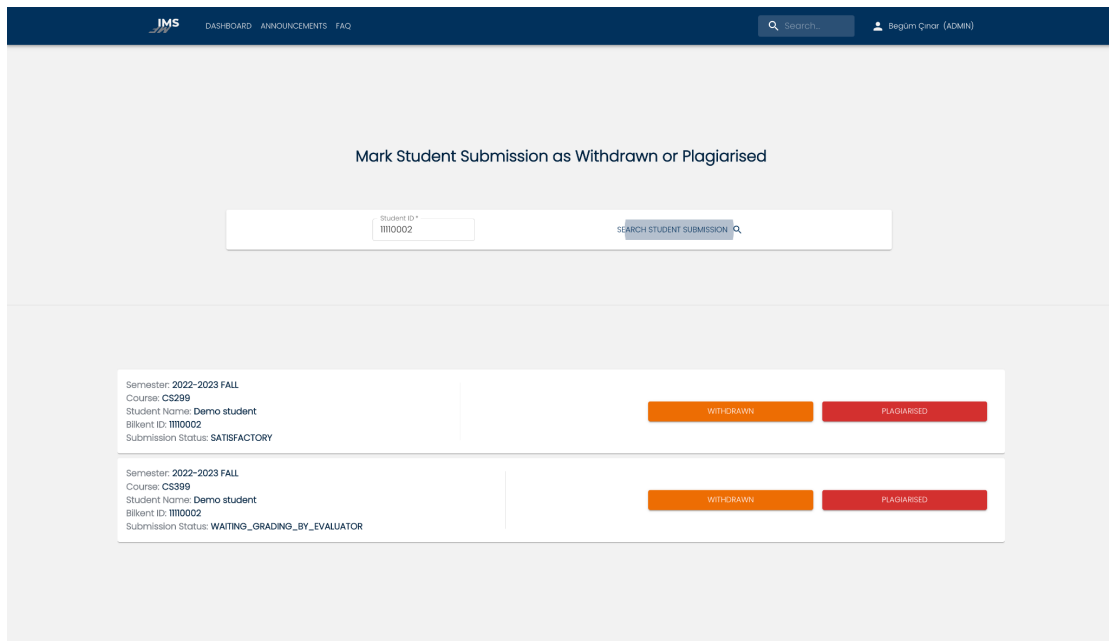


Figure 15: Mark Student Submission as Withdrawn or Plagiarised Page

Admin can search student submissions by writing down students' Bilkent IDs and view their submission(s) after clicking the “Search Student Submission” button. Admin can mark the student's submission as withdrawn or plagiarized by

the buttons accordingly. In case the admin wants to mark the student submission as withdrawn, he/she needs to confirm this action by clicking “Yes” for the following pop-up confirmation and “No” for the other case.

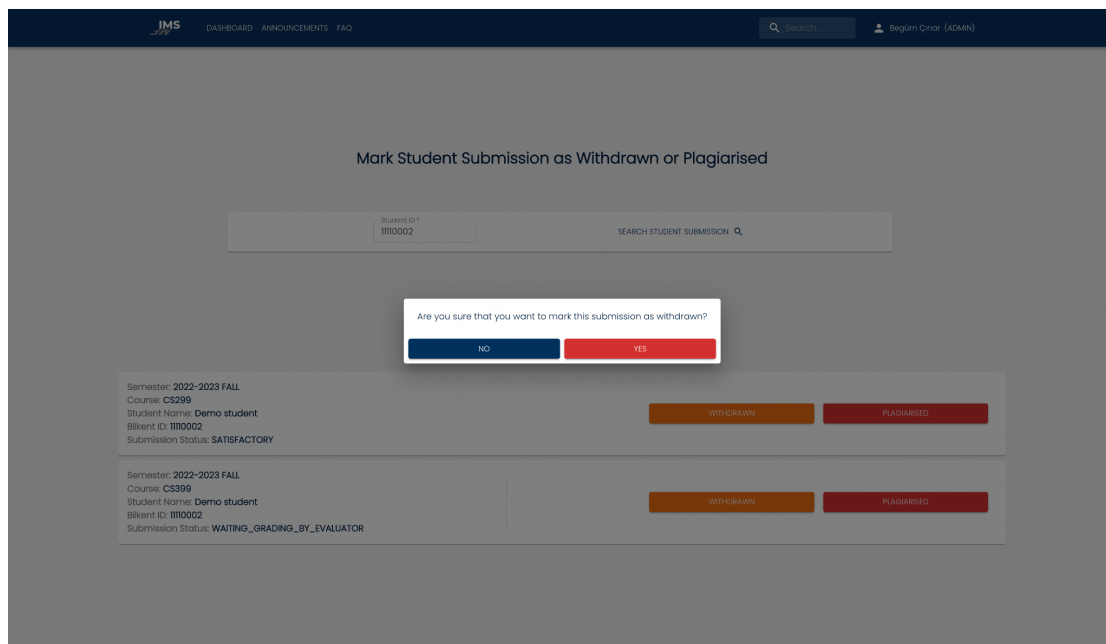


Figure 16: Mark Student Submission as Withdrawn Confirmation Dialog

In the other case that the admin wants to mark the student submission as plagiarized, the admin needs to write down a reason why this submission is plagiarized & confirm this action as demonstrated for the withdrawn scenario.

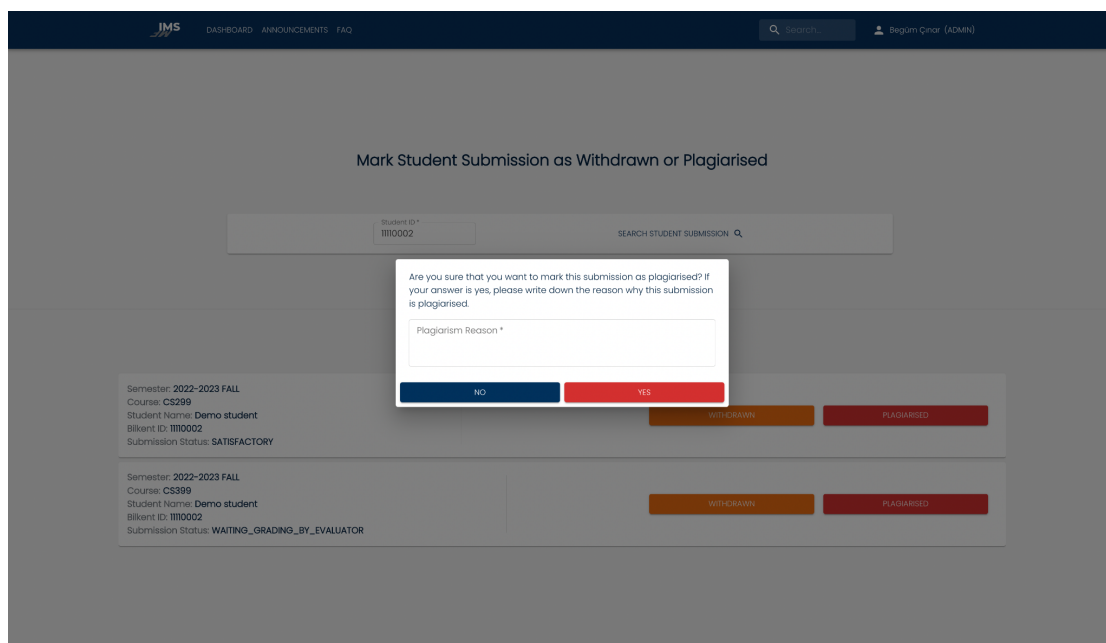


Figure 17: Mark Student Submission as Plagiarised Confirmation Dialog

3.11 Uploading Company Evaluation Reports

Upload Company Report	
Student ID* 1110002	SEARCH STUDENT SUBMISSIONS
Semester: 2022-2023 FALL Course: CS299 Student Name: Erdem Eren Çağlar Bilkent ID: 1110002 Submission Status: SATISFACTORY	DOWNLOAD REPORT DELETE REPORT
Semester: 2022-2023 FALL Course: CS399 Student Name: Erdem Eren Çağlar Bilkent ID: 1110002 Submission Status: WAITING GRADING BY EVALUATOR	CHOOSE FILE UPLOAD

Figure 18: Upload Company Report Page

After providing the student's Bilkent ID & clicking the "Search Student Submissions" button, the admin can view the student's submissions. Admin can upload the student's company evaluation report by choosing a file from their device through the button "Choose File" & uploading it by the "Upload" button. Admin can also download the company evaluation report of the student if the company evaluation report is already uploaded. Admin can delete the student's company evaluation report if required & then re-upload it following the same steps provided above - if the student's internship submission evaluation is not completed.

3.12 Viewing Student Submissions

Search / View Student Submissions

Student ID *
11110002

SEARCH STUDENT SUBMISSIONS

Semester: 2022-2023 FALL Course: CS299 Student Name: Erdem Eren Çağlar Bilkent ID: 11110002 Submission Status: SATISFACTORY	VIEW
Semester: 2022-2023 FALL Course: CS399 Student Name: Erdem Eren Çağlar Bilkent ID: 11110002 Submission Status: WAITING GRADING BY EVALUATOR	VIEW

Figure 19: Search / View Student Submissions Page

After providing the student's Bilkent ID & clicking the "Search Student Submissions" button, all of the submissions of the student are listed as follows. Admin can view the student's submission more detailedly by clicking the "View" button for each submission of the student. After clicking the "View" button, the admin is redirected to the following page.

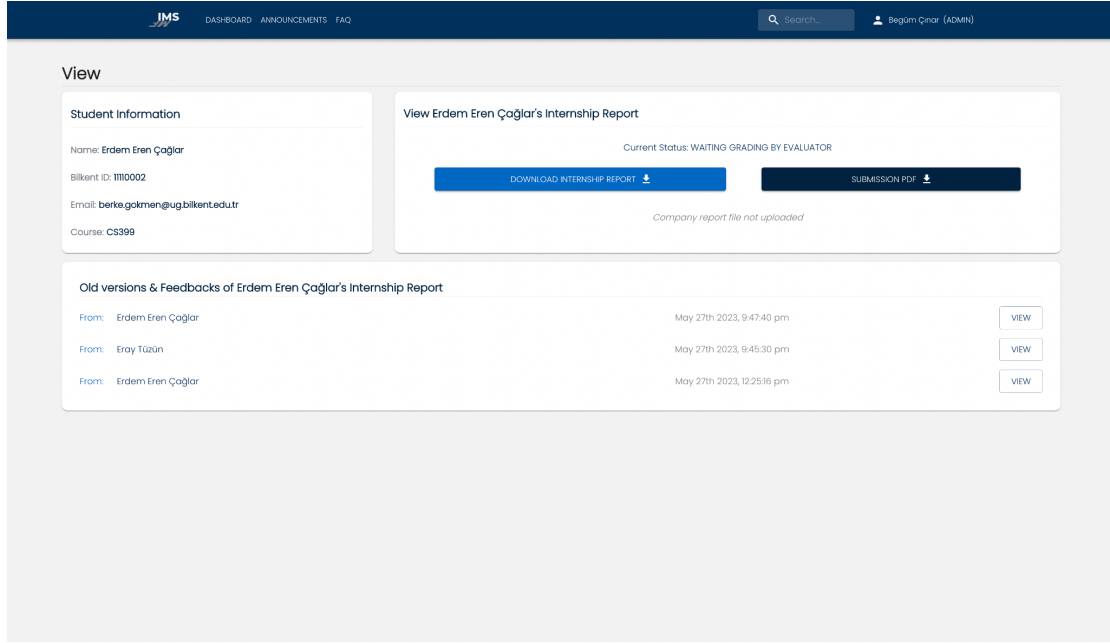


Figure 20: Admin's Student Submission View Page

Admin can view the previous reports of the students and feedback from the assigned assistant and evaluator in the "Old Versions & Feedbacks" section. Admin can check the student submission's status and download the student submission's company evaluation report - if uploaded, internship report - if uploaded & submission pdf.

4 Build Instructions

As a result of our incentive to use state-of-the-art development techniques, we have adopted Docker, a containerization tool for running software on any platform easily without dealing with dependencies and versions. Thanks to Docker, the Internship Management System can run on any platform, including MacOS, Windows, Linux, etc. The step-by-step build instructions are as follows:

1- Install Docker if you haven't already. You can click [here](#) to go to their website.

2- Configure the environment properties through `./env.local`. You will need to get AWS Access and Secret keys alongside the mail password. For these, you can contact [Ahmet Berke Gökmen](#) on Slack and request credentials. You can just leave other properties as they are. Moreover, you can request the MongoDB connection string already deployed to the production and running if you wish. Doing so will have some data directly loaded and ready to be used in your local environment.

3- Run the following commands on your terminal in the project directory

```
$ ./mvnw dependency:resolve
$ ./mvnw package
$ docker compose up -d
```

3.1- The first command downloads the latest versions of the required packages. This step can be skipped after one launch of the application.

3.2- The second command executes the package directive, creating a JAR file of the backend service.

3.3- The third and final command starts all the required services, MongoDB, Redis, and Redis Commander, a visualizer for the Redis database.

After these commands, the following services will have started on the following addresses.

Redis: `redis://localhost:6379/`

MongoDB: `mongodb://localhost:27017/`

Redis Commander: `http://localhost:8081/`

Backend Service: `http://localhost:8080/`

4- Navigate to the frontend directory in your terminal and execute the following command.

```
$ npm i && npm start
```

3.1- The first command downloads the latest versions of the required packages. This step can be skipped after one launch of the application.

3.2- The second command executes the start of the application. React software will run the application on port 3000.

3.3- If you wish, you can disconnect the front-end from the production backend and connect it to your local backend by navigating to `src/services/axiosInterceptor.js` and removing the following `http://bilkent-internship-management.eu-central-1.elasticbeanstalk.com`. Doing so, your frontend application will connect to your local backend.

After these commands, the frontend application will have started on the following address: `http://localhost:3000/`

5- That's it. You now have all the services up and running. However, if you do not want to deal with running the application just for testing, you can directly visit our deployed instances.

Backend:

`http://bilkent-internship-management.eu-central-1.elasticbeanstalk.com/documentation`

Frontend:

`http://bilkent-internship-management-frontend.s3-website.eu-central-1.amazonaws.com/login`

You can again contact **Ahmet Berke Gökmen** for sample user credentials alongside a database connection string to see what's going on in the database using the [MongoDB Compass](#) tool.

5 Work Allocation

Ahmet Berke Gökmen:

Analysis Report:

- Proposed System
- Actors
- Non-functional Requirements
- Use Case (with everybody)
- Evaluation Activity Diagrams
- State Diagram for Part A
- State Diagram for Final Course Grade

Design Report:

- High-Level Software Architecture
- Object Design Trade-offs
- Design Patterns

Implementation:

- Backend service initialization & Dockerization.
- Backend authentication & authorization (roles) flow.
- Frontend authentication & authorization (roles) flow (with Erdem).
- AWS Deployments of both backend and frontend services.
- Automatic GitHub CI/CD pipelines.
- Deployments of Redis, MongoDB, and AWS S3.
- Backend architecture implementation.
- Everything related to submissions. Status transitions, grading logic, etc.
- Mail sending system and automatic cron jobs to periodically send emails.
- Full-text search for users.
- Swagger API Documentation implementation.
- Helped implement the front-end.

Erdem Eren Çağlar:

Analysis Report:

- Introduction
- Use Case (with everybody)
- Assistant & Evaluator assignment activity diagrams
- State diagram for semester initialization & deactivation
- User Interface

Design Report:

- Introduction
- Purpose of the system & design goals
- Subsystem decomposition review
- User Interface Management Layer (with Alperen)

Implementation:

- Frontend service initialization.
- Frontend authentication & authorization (roles) flow (with Berke).
- Password reset, change & forgot password pages.
- Student, assistant & evaluator dashboard pages.
- Assistant & evaluator assigned student submissions pages.
- Assistant & evaluator submission evaluation and grading pages.
- Implementation of file downloading.
- Admin's assign assistants and evaluators to submissions pages.
- Admin's export semester page (statistics & grades).
- Revision & UI improvement of other pages/components.

Ahmet Alperen Yilmazyıldız:

Analysis Report:

- Current System
- Use Case (with everybody)
- Pseudo Requirements
- State Diagram of Part A
- State Diagram of Part B and C
- User Interface of some pages

Design Report:

- User Interface Management Layer (with Erdem)

Implementation:

- Worked on the front-end of the project.
- Admin dashboard page.
- Create a semester page.
- View and edit the deadline components.
- Mark submission as withdrawn or plagiarism page.
- Student create & update submission page.
- Search user UI improvement.

Mahmut Mert Gençtürk:

Analysis Report:

- Object and Class Diagram
- Use Case (with everybody)
- Non-functional requirements

Design Report:

- Object Design Trade-offs
- Final Object Design
- Data Management Layer & Entity Diagram

Implementation:

- Worked on the backend of the project.
- General structure design with Berke Gökmen

- Database and model design
- File uploading structure & integration of AWS S3
- Excel file reading & integration of Apache
- Grading questions initial structure (Berke Gökmen finished)
- Statistics Excel file creation
- PDF file generation
- Announcements and Frequently Asked Questions services.

6 What We Did, Did Not

We have completely implemented the requirements we specified in the Analysis Report and the system supports all the cases in the use case diagram. We have implemented some additional functionalities we did not think of at the start and removed some of them. In the first design, we thought there was no support for any deadline and there was not a Super Admin/Department Chair user. Throughout the implementation, according to the feedback we received, we added these to the system. Also, at the start, we were thinking about implementing a one-time link system to receive company evaluations directly from the internship supervisors; however, according to the feedback of the department secretary, we decided not to implement such a feature. Instead, we allowed Admin users to directly upload the company evaluation forms of a student.

There are some additional functionalities that we did not have time to implement. The first one is a direct communication service inside the system. We were thinking that we could implement a system similar to the one in SRS that sends mail to the selected persons via the system mail address. While backend services are relatively easy to write, we suffered from a breakup in the group, and therefore our plans have changed and we prioritized the vital functionalities instead of the mail communication system. However, our system still sends different types of information mail to users. One additional thing we couldn't implement was the announcements and frequently asked questions pages. While the backend services of these pages are completed, the frontend part did not finish, again because of the breakup we had lived through. Also, we were thinking of implementing an e-sign system to decrease the workload of faculty staff. However, since we didn't have much information about the legal part of the e-sign process and since it would take some time to implement these features, we decided not to polish our system instead.

Even though these problems we encountered, our system supports a full, healthy life cycle of an internship grading process. The main functionalities do not suffer from any problems. Additionally, we can send users different types of information mail, create users based on an Excel file to ease the integration with SRS, create Excel statistics files, prepare a PDF document of a finished submission just waiting to be signed and store all the file data in AWS S3 to satisfy information and security conditions. Also, our system supports scheduling so given deadlines can be executed automatically. The system also supports grade exports at the end of the semester to ease the integration with SRS again.