

AMERICAN UNIVERSITY OF BEIRUT

Project 39:
Student Resources Portal

by

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A final year project
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Acknowledgements

The project will be implemented in collaboration with another AUB team called the university innovation fellows UIF team. This team is qualified successfully to participate in the university innovation fellows program running by the Stanford University's Hasso Plattner institute of Design.

The UIF program empowers the participated students and trains them to make a change at their universities. After attending several workshops trainings in the program, the AUB UIF team decided to create a project to facilitate student's university life. Their main idea was implementing a platform in which students can receive the help and the knowledge about AUB life.

After noticing the similarities between the two teams, Dr. Dana Al Batlouni, the coordinator of the UIF team and the one who responsible for the HCD part in FYP, asked us to collaborate together. At first, the initial set of features we had in mind were presented to the UIF team and compared with the features they had in mind. It was evident that the UIF team features are a subset of our initial specified features. The UIF team became our main stakeholders since then. Several meetings were made and the two teams started working in parallel to implement the first effective "HOW TO AUB" application.

Moreover, the roles of the UIF team with respect to our project can be summarized as follows:

1. They are one of our stakeholders. They provide us feedback on every implementation iteration. Their feedback is highly significant and taken into consideration. The several design iterations were actually a product of their feedback.
2. As part of their HCD course, they are required to also interview people and stakeholders. The feedback from their stakeholders is constantly delivered to us through virtual or physical meetings. So, the UIF team are the communicators with AUB students and other stakeholders on our behalf.
3. They are responsible for the data collection process. The UIF team orga-

nized several meetings with AUB staff, IT and administrators. The meetings include explaining our strategy plans and getting insights on how these AUB members can help us in the data collection process. The data that we are trying to collect is mainly for organizing the datasets of our recommender system, which will be discussed in the recommender system implementation section. Moreover, as to facilitate data retrieval from certain AUB websites, we require access to certain databases such as the course offerings for a specific semester. Basically, the UIF team is the mediator between university and us as designers.

In general, the FYP team is responsible for everything related to implementation and coding; while the UIF team is responsible for providing resources and data for the implementation, communicating with the AUB official hierarchy to allow the access for needed data for the implementation, and supporting the FYP team with their feedback on a regular basis.

Executive Summary

As the use of mobile applications and new technological advances is increasing day by day in multiple fields like social media, gaming, communication and medical systems; the use of mobile applications in higher education institutions is advocated for a finer student experience [1]. In parallel with that, the artificial intelligence field is rapidly emerging and proving to be effective in human assistance. From here, we see the beneficence of integrating AI tools in university application platforms to effectively serve students in various educational activities [2].

Moreover, as AUB students, we realized that there is no mobile application that combines all AUB related systems and crucial information for AUB students. With AUB being one of the most influential institutions in the MENA region [3], we thought we could give back to our AUB community in our Final Year Project and provide its students with a better university experience. We thus dedicated our FYP topic to develop an IOS and android compatible application for AUB students.

The approach used to develop the application will be an agile software development approach. Agile approaches allow users to be a significant part of the development process. Consequently, to determine the requirements of the application, we interviewed some AUB students from different educational levels (Freshman, Sophomores, Juniors, Seniors and Alumni) to identify their needs and work based on that. We also researched several other university applications to get a sense of some functionalities.

As we did this, we conducted new interviews with our stakeholders and updated the requirements again accordingly. The current application requirements include easier information access for students, an on campus interactive map and a recommender system that displays personalized recommended courses and workshops for students. In addition to that, the system will notify students of important dates and deadlines.

Moreover, the application will contain a communication platform by which stu-

dents can ask questions and get support from other students or alumni. Given the above requirements, one of the major constraints we might face is time constraints and data accessibility constraints with respect to AUB policies.

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Chapter 1

Introduction

In this chapter, you should briefly discuss the main features of your final prototype by focusing on what you have achieved. The following sections must be included:

1.1 Project Needs and Motivation

In recent days, the use of mobile applications in higher education institutions is advocated for a finer student experience [1]. Software development is the art of transforming real-world objects, processes, and interactions into code structures that resemble sentences, paragraphs, and chapters of a book. Software development appears to involve more engineering than invention. It is the process of creating new software solutions. [2]. There is no mobile application for AUB students. Instead, AUB has multiple online systems, like aubsis, moodle, office 365 and the AUB website. Therefore, it is valuable to implement a system that provides centralized access to all those tools. As we recently experienced the on-campus return and based on a number of interviews conducted with multiple AUB students (Freshman, Sophomores, Juniors, Seniors and Alumni) to get a clearer picture on the student's university needs, it came across that most students needed different forms of assistance including registering courses, finding on campus class locations, getting guidance and feedback from other students and being notified for important news and activities. From here emerges the need to develop a system that can benefit AUB students in multiple aspects of their university life. Our aim is to develop a user friendly AUB students' application that provides ease of accessibility and mentorship for both new and old students. The approach used to develop the application will be an agile software development approach. Agile approaches are based on incremental development. The application requirements were specified based on several interview iterations whereby in each process we got feedback and suggestions which we used in updating our requirements list. Moreover, we took cues from other university mobile applications and found the most prominent features present in them. Those features

were then suggested on students and other stakeholders from the University student services staff who decided whether they should be included as requirements in the new system or not.

The application will facilitate information access for students as it will include all AUB related information that a student might need like scholarship programs, job and internship opportunities, course syllabus and information, transcripts, workshops and news. It will also include an on campus interactive map that helps the student reach a desired location on campus. Moreover, the application will include a filter system that displays clubs and workshops for students based on their interests. Moreover, the application will contain a communication platform by which students can ask questions and get support from other students or alumni.

1.2 User Requirement Specifications (Functional Requirements)

Table 1.1 represents the source and priority of the user requirements listed below

1. The system should include a calendar that allows students to view upcoming events and deadlines
2. The system should send the user daily reminders concerning his/her assignments.
3. The system should recommend for the user all the events, workshops, clubs, courses based on his/her preferences.
4. The system should allow the user to view all his/her academic entities in an organized manner. The user should be able to access his/her courses and personal information (web statement of fees, courses registered, academic transcript etc..).
5. The system should allow the user to manually organize his/her preferences (assignment notifications, course notifications, etc...)
6. The system should prompt the user to choose from a list of interests after the first time signing up. The selection can be modified by the user anytime and it will be used for recommending workshops and clubs.
7. The system should combine all the university platforms together. It should include links to moodle, aubsis, page about scholarships and any other university system used.

8. The system should include a forum that allows students and alumni to participate in providing advice concerning the workshops, events, employment, and internships.
9. The system should contain a university map that always provide students with the shortest path to any area.
10. The system should send the user important news and workshops.
11. The system should include a student university guide.
12. The system should recommend nearby areas to study at.
13. The system should provide the user with information about the courses, and the user should be able to filter courses by department name.
14. The system shall be able to generate student schedules.
15. The system should be able to categorize the courses (technical elective, GE, ...) based on the attribute of courses and based on what the student took so far.

Table 1.1: User Requirements Table

ID	Source	Priority
1	Interviewee 6,Junior student-NAUgo university app-Valencia College	9
2	Interviewee 10	7
3	Shaza-Dina-Mohamad-Jad-Valencia College-Interviewees 1,3,5,Sophomores and Senior Students	2
4	Shaza-Mohamad-Dina	11
5	Mohamad	5
6	Shaza-Dina- Mohamad- Jad- interviewees 2,3,5	1
7	Professor Ali Hajj-Jad-Dina-Mohamad-Shaza-interviewee 7, Alumni-UHgo university app	13
8	Interviewee 8, New Freshman Student-UHgo university app	12
9	Mohamad-Dina-Shaza-UHgo university application	3
10	Mohamad	6
11	Mohamad-Jad	14
12	Mohamad-Shaza-Dina-Jad- interviewee 4,8	15
13	Interviewee 9	8
14	Dina-Shaza-Mohamad- Jad	4
15	Dina-Shaza-Mohamad- Jad	10

1.3 Non-Functional Requirement Specifications

1.3.1 Usability Requirements

1. All users must be able to use the system in an easy way. A user should be able to learn how to use the system in less than 30 minutes, registration should take less than 5 minutes.
2. High quality user interface that combines the university's services in an organized way.
3. The system should be supported on multiple operating systems.

1.3.2 Maintainability

1. Updates and modifications should be easily done to the system when needed such that the system should be able to support new services and new requirements in the future.

1.3.3 Security Requirements

1. The system should have a very high security against attacks, and it should include endpoint protection and data backup. It should also implement user MFA (Multifactor authentication) to allow more security into the system.
2. The system should implement a reliable service by avoiding breaching in the system; Students must not be able to access other students' private information.
3. A university student should use the university's Microsoft account and password for signing in.
4. The system shall implement user privacy provisions as set out in the privacy policy, and the system should not access any type of information that the user has not given consent to (example moodle, aubsis).

1.3.4 Availability

1. The system should be accessible 24/7 for all users.

1.3.5 Performance

1. The website/application should load in less than 2 seconds and services/requests should be performed in less than 3 seconds.

2. Ensure existence of required components at run time.
3. The system's response time in displaying new updates and information should not exceed three seconds.
4. The system shall take no more than 6 seconds to refresh after failure.
5. The system should support at least 500 users simultaneously. (8000 is the total number of aub students)
6. The system is allowed to make errors only one time per three months of working days.
7. The downtime system should not exceed five seconds in any normal day.

1.3.6 Application Services

1. Users must be notified at least 2 days before a scheduled maintenance that should be executed outside the following hours (8 am -12 am)

1.4 User Stories

Table 1.2 represents the

1. As a student I want to view all the events and the assignments in a calendar form.
2. As a student I want to receive reminders for my assignments so that I don't forget an assignment.
3. As a student I want to see all my academic entities in an organized manner (web statement of fees, transcript, etc...) so that I can access my personal information easily and in a user-friendly interface.
4. As a student I want to manually organize my preferences (on or off notifications) so that I could receive up to date notifications for what I want only.
5. As a student I want to view courses, workshops, clubs, etc... so that I am informed about the offered courses and clubs at AUB.
6. As a student I want to choose from a list of interests so that only the workshops I'm interested in pop-up.
7. As a student I want to view all university platforms in one combined platform so that It is easier for me to access information in one place.

8. As a student I want to receive guidance from students so that I could receive recommendations and help concerning internships, workshops, clubs, etc... .
9. As a student I want to have a map with shortest path to classes so that I could reach buildings in a faster way.
10. As a student I want to receive important university news and workshops so that I am always up to date on what is happening on campus.
11. As a student I want to have a university guide so that I am familiar with the university's system and the university life.
12. As a student I want to view recommended areas to study at so that I could study when the library is full, or when I want a change in studying areas.
13. As a student I want to view course information so that I could learn more about what the course is about and how the semester is usually going.
14. As a student I want to have my schedules generated so that I can form multiple schedules as a back-up based on my preferences.
15. As a student I want to view my courses list categorized so that I know what courses I have left (humanities, social sciences, etc...).

Table 1.2: User Stories Ratings Table

ID	Dina	Shaza	Jad	Mohamad	Average
1	3	2	2	3	2.5
2	2	3	3	2	2.5
3	1	2	1	2	1.5
4	5	5	5	5	5
5	2	1	2	1	1.5
6	3	3	5	5	4
7	5	5	5	5	5
8	5	5	5	5	5
9	3	3	1	2	2.25
10	1	1	1	1	1
11	1	1	2	1	1.25
12	2	2	2	2	2
13	3	3	2	3	2.75
14	5	5	5	3	4.5
15	5	3	5	5	4.5

Stories having a rate more than or equal to 5

Stories with IDs 4, 7, and 8

- 4.1 As a Student I want to view recommended courses So that I can easily pick courses based on my preferences and previous experiences
- 4.2 As a Student I want to view recommended workshops So that I can see the ones I prefer only and attend them
- 7.1 As a Student I want to communicate with alumni students So that I could receive recommendations and help concerning internships, workshops, clubs, etc...
- 7.2 As an Alumni I want to Share my experience and communicate with students So that I benefit other students and give them effective feedback
- 8.1 As a Student I want to Have a University map So that I have an overview of the university campus
- 8.2 As a Student I want to know the shortest path to an place in university So that I could reach buildings in a faster way.

Table 1.3: User Stories Updated Table

ID	Dina	Shaza	Jad	Mohamad	Average
4.1	3	3	3	3	3
4.2	2	2	3	2	2.25
7.1	3	3	3	3	3
7.2	3	3	3	3	3
8.1	3	2	2	2	2.25
8.2	3	2	3	3	2.75

1.5 Deliverables

The deliverables at the end of the Spring 2022 semester is a fully functional mobile application that includes:

- All AUB related information that a student might need like scholarship programs, studying areas, job and internship opportunities, course information, transcripts, workshops and news.
- An on campus interactive map that helps the student reach a desired location on campus.

- A system that filters courses, clubs, and workshops for students based on their interests.
- A notification system that notifies students of important dates and deadlines ahead of time.
- A forum by which students can ask questions and get support from other students or alumni.

1.6 Related Work

In this section, you include a discussion about the literature review performed in EECE 501. Focus on the work available in the literature that was beneficial in implementing your FYP project. You should end this section by emphasizing on what is available in the literature and how did you benefit from the literature to have your project fully functional.

Do not forget to include the appropriate citations to all the papers or other relevant resources.

The citation should be as follows: In this paper [?], the authors ...

In this section, we will be discussing the advantages and the features learned from other university platforms.

1.6.1 Valencia College Web-App

The advantages of the work presented are that Valencia college university application links all students [4], faculty and staff to many resources such as LifeMap, online registration, grades, financial aid, academic records, important dates to look for, and degree audits all in one page called Atlas.

Figure 1.1: Valencia Homepage

Fig. 1.1 presents all of the resources found in one page which the student can access

Valencia also has a page called “Hot classes” which helps students find interesting and fun classes. Fig. 1.2

Course	CRN	Title	Days	Time	Building-Room	Instructor
CRW 2001	1035	Creative Writing and Adv Comp	M W	11:30A - 12:45P	004-306	Ryan Tullis

Course	CRN	Title	Days	Time	Building-Room	Instructor
CRW 2001	16465	Creative Writing and Adv Comp			INE-	Diane Orsini
ENC 2341	12729	Advan Creat Writ-Literary Mag			INE-	Jackie Zuromski
ART 2500C	17566	Painting I	T	10:00A - 12:45P	005-224	Marcus Barrett

Figure 1.2: Valencia Hot Classes

LifeMap section is an important section that helps the student to pick his/her path/career along with setting up everything needed in order to always be ready.
Fig. 1.3

The screenshot displays the Valencia LifeMap interface with the following sections:

- My Education Plan**: Features three diverse students in academic attire. Text: "As a Student, My Education Plan helps:
 - Provide real-time academic advice
 - You plan your entire degree to speed time to graduation
 - Facilitate building a class schedule each semester for your Registration Cart[Take Me to My Education Plan](#)"
- My Career Planner**: Shows hands working on a laptop with a resume. Text: "The first step in figuring out your major is to decide on your career goal. This decision should be made after considering aspects about yourself, such as, your interests, values, skills, and personality. My Career Planner will link you to a program named My Plan in order for you to complete career-related assessments. My Plan will be available to you even after graduation, so you can update your choices as you move through life."
ATTENTION NEW USERS: If you need to register for a new account, please use license code 3PRFCJE6 to register.
[Take Me to My Plan](#)
[Click for More Info](#)
- My Financial Planner**: Shows a person calculating on a calculator. Text: "Learn how to spend & save more wisely, borrow better, organize your finances & read your credit report."
[Log in or Create a GradReady Account](#)
- My Portfolio**: Shows a person working at a computer. Text: "My Portfolio"
- Degree Pathways**: Shows two people in a classroom setting. Text: "Degree Pathways"

Figure 1.3: Valencia LifeMap

Fig. 1.4 A preview of the education planner page

The screenshot shows the Valencia Education Planner interface. At the top, there are tabs for 'Worksheets' (selected), 'Notes', 'GPA Calc.', 'Format', 'View', 'Save/Print as PDF', and 'Class History'. Below this is a 'Student View' section showing 'AA130Mdg as of 09/15/2021 at 06:36'. It includes fields for Student ID, Name, Degree (Associate in Science Degree), Major (AS EET Career Path AS to BS), Last Audit (09/15/2021), and a dropdown for 'What If' scenarios. A 'Look Ahead' section is also present.

The main content area is titled 'Valencia College - Degree Checklist' and displays the requirements for the 'Associate in Science Degree'. It lists completed requirements (0%) and unmet requirements (68 credits required). The requirements include:

- Degree in Associate of Science** (Completed)
 - An overall minimum GPA of 2.0 will be required for graduation.
 - A minimum Valencia GPA of 2.0 will be required for graduation.
 - You have not met Valencia's Residency Requirement.
 - Major Requirements
- Electronics Engineer Tech/EET Career Path AS to BS** (Unmet)
 - Unmet conditions for this set of requirements: 68 credits are required.
 - FOUNDATION COURSES
 - The New Student Experience
 - Freshman Composition I

At the bottom right, it shows 'Electronics Engineer Tech/EET Career Path AS to BS GPA: 0.00', 'Credits Required: 68', 'Catalog Year: 2018-2019', and 'Credits Applied: 0'.

Figure 1.4: Valencia Education Planner

The students section gives an overview of what classes the student has available in the semester, financial aid requirements, student resources, student forms, skill shops, tips and advices, transcripts, and many more. Fig. 1.5

The screenshot shows the Valencia Students Section with several sections:

- Student Activities**: Your Class Ended. We're Just Getting Started. Attend an event. Join a club. Start a movement. Student life goes well beyond the classroom. Includes a 'Get Involved' button.
- Downtown Campus Student Tools**
- Student Resources**: Academic Resources, Bridges to Success Program Students, Business Office, Financial Aid, Personal Information, Reference Information.
- Student Forms**: Admissions & Records, Applications, Financial Aid, Registration.
- My Account**: My account balance.
- Financial Aid Requirements**: You have no Financial Aid Requirements for this aid year. 2021-2022 Academic Year. Choose Another Aid Year. Message, Holds, Financial Aid Status, Progress.
- My Transcripts**: Valencia Transcript Request Form, Status of Valencia Official Transcript Requests, College Transcripts Received from other Colleges, High School Transcripts.
- Path to Graduation**: Begin your path to Graduation:
 1. My Academic Progress (Degree Audit)
 2. Graduation Application
 3. Graduation Application Status
- Student Work Study**: At this time you are not authorized for employment under a Financial Aid Work Study Program.
- Health & Wellness**: BayCare Health System (Free and Confidential).

Figure 1.5: Valencia Students Section

Atlas is a very powerful student portal which combines all necessary and

important tools and resources for the students to be up to date on, and know what is available for them without the help of a third party tool.

1.6.2 UHGo University Application

The application was nominated for the 10 Best university apps [5] and it includes the following features:

- Bus tracking feature
- Dinner and on campus cafeteria menu options
- A registration platform for adding classes
- A communication Platform for students and alumni to interact
- An on campus map
- A news platform with the most recent university updates
- An event platform showing all upcoming events
- The app is ios and android supported

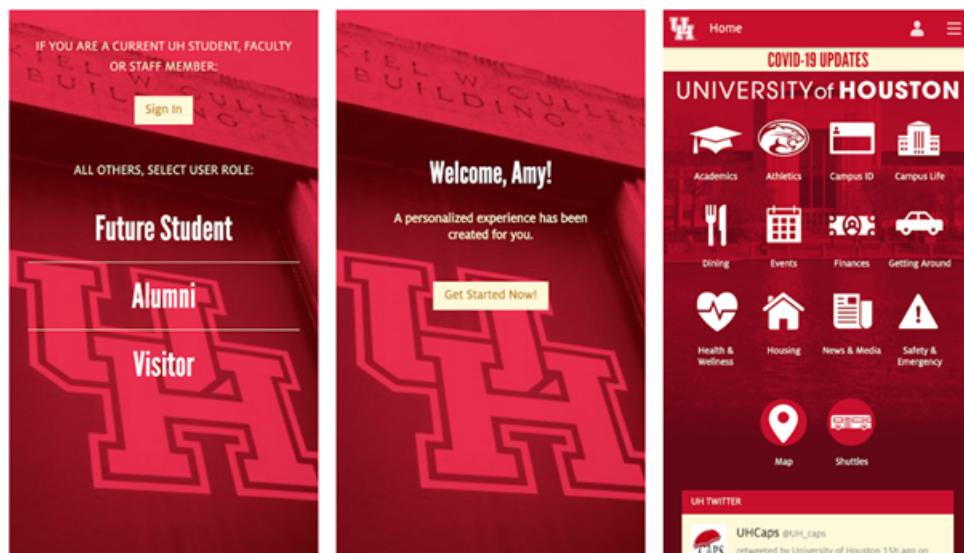


Figure 1.6: UHGo Homepage

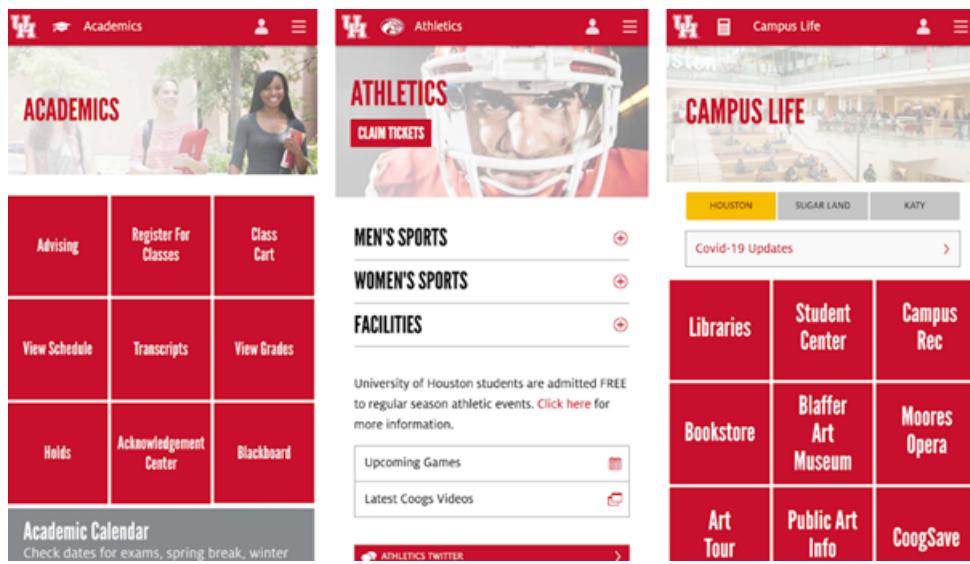


Figure 1.7: UHGo Different Pages Available

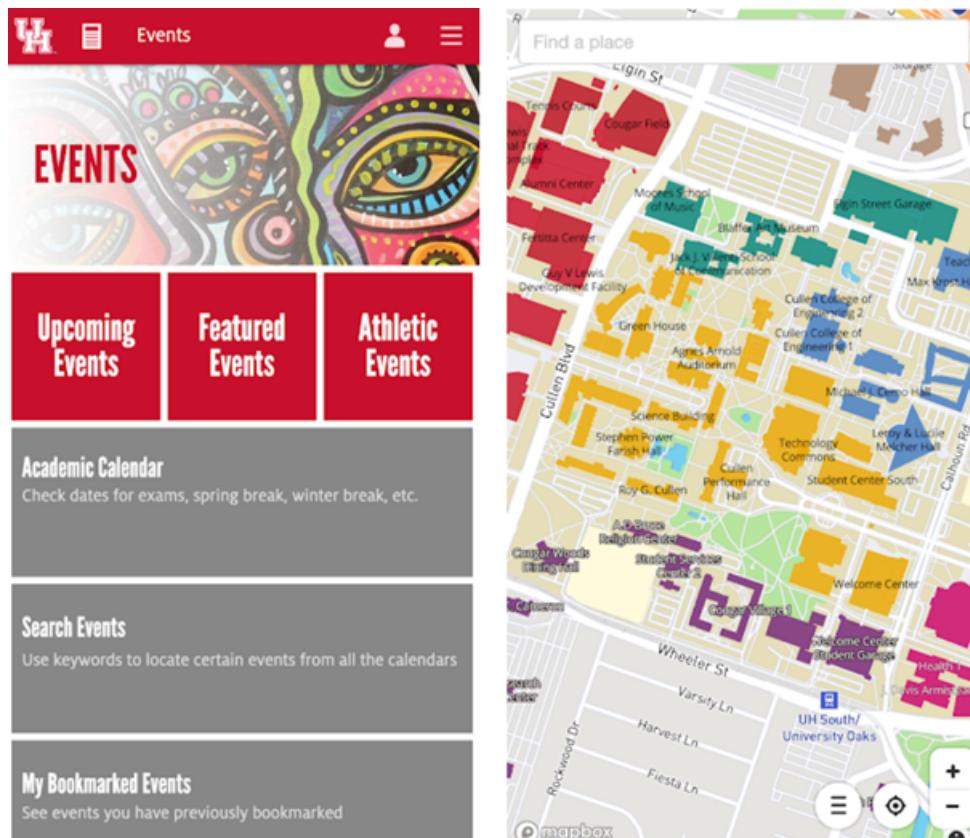


Figure 1.8: UHGo Maps

1.6.3 EPFL Campus University Application

An all-in-one app for EPFL made by PocketCampus. [6]

- Tells you when and where your next class is
- Recommends you best places to eat
- Access to course documents
- Detailed campus map and pinpoints where you are now
- EPFL community hub (communicate with other EPFL students)

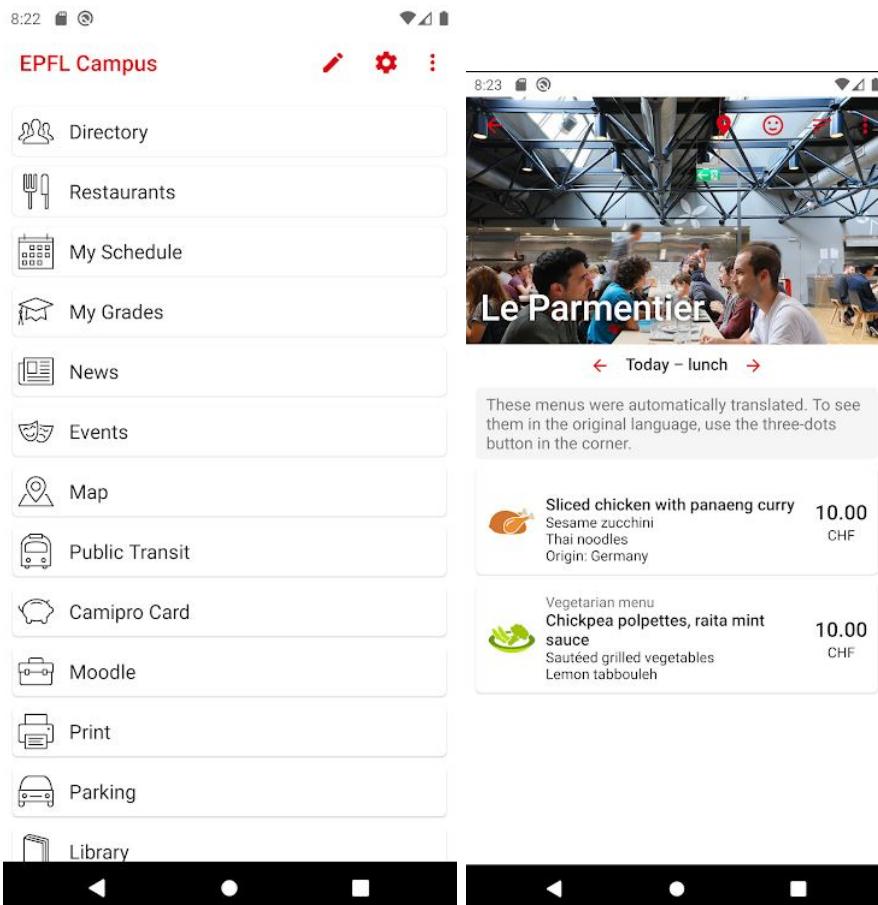


Figure 1.9: EPFL App

8:29 8:24

Thermodynamics a... FILES & FORUMS ASSIGNMENTS GRADES

General

Announcements

16 September - 22 September

- Thermo1_formulas
- Thermo1_tables
- Thermo1_allSlides_2018
- Haussener_Thermo1_slides1
- Thermo1-Exercise 1
- Thermo1-SolEx1
- Thermo1_admin

30 September - 06 October DETAILS

- Haussener_Thermo1_slides4
- Haussener_Thermo1_slides5

Print at EPFL

EPFL Campus allows you to very easily print PDF documents on EPFL printers.

Print From Moodle
Find the document in the Moodle section of the app, tap the « : » button, and select *Print*.

Print From Other Apps
Look for the share icon, then select *Print at EPFL*. You can also use the browse button (in the top right corner) to pick and print a file.

Find a Printer
[Show printers on the map](#)

What do I do Next?
Once you have printed the document from the app, follow [these instructions](#) to have it actually printed by a printer.

A question or a problem with printing from the app? [Contact us!](#)

Repro – EPFL Print Center
The unit is attached to the DII and offers services such as digital, offset and large-format printing, as well as binding and graphic design. [Learn more](#). [Show Repro on the map](#).

Print Credit

8:25

Directory

jean

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SCI-STI-JMV SEL-ENS

Jean-Louis Scartezzini
LESO-PB SAR-ENS

Jean-Luc Martin
PH-SB

Jean Buttet
PH-SB

Jean-Jacques Paltenghi
PH-CDM

8:26

News

FEEDS

Search

Watching single protons moving at water-solid interfaces
Today

First pilot for the Google and Apple-based decentralised tracing app
Yesterday

2:33

INN328

on Station Station

3:06 PM Wed Apr 10

My Schedule

4/9/19 Monday	4/9/19 Tuesday	4/10/19 Wednesday	4/11/19 Thursday	4/12/19 Friday
		8:15 AM CE 1.4 Digital systems design	8:15 AM CO 1 Advanced information, computation, communication II	
10:15 AM CE 1.6 Analysis II	10:15 AM INF 3, INF 2 Digital systems design	10:15 AM CO 1 Analysis II	10:15 AM INR 219, INM 202, INJ 218, INM 203 Advanced information, computation, communication II	
				12:15 PM INF 3, INF 2 Practice of object-oriented programming
	1:15 PM INF 2, INF 3 Practice of object-oriented programming		1:15 PM INF 3, INF 2 Practice of object-oriented programming	
				2:15 PM CE 1.6 Digital systems design
3:15 PM CO 1 Practice of object-oriented	3:15 PM SG 1138 Advanced information,	3:15 PM CO 017, CO 015, CO 124, CO 011, CO 123, CO 122, CO 016, CO 010		

Floor 3 EPFL

campus.epfl.ch

EPFL Campus

Map

INN 328

BC 304 BC 303 BC 302 BC 301 BC 300

BC 370 BC 368 BC 367 BC 363 BC 359

INN 311 INN 330 INN 329 INN 328 INN 327

INN 316 INN 317 INN 318 INN 319 INN 315

INN 314 INN 313 INN 312 INN 311 INN 310

Floor 3

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1.6.4 BAU Student Instructor Portal

This is another type of portals that is created in BAU [7], by which the purpose from this portal was:

- To improve the relationship between students and instructors and makes educational life easier for them both.
- To fulfil the requirement of Bachelor of Science. A methodology was implemented used in project management by which it describes the stages of project development.

Also, BAU implemented a student portal which is a secure portal called iConnect; This secure portal is where both students and university staff can check e-mail, register for courses, and explore the different features of the portal.

iConnect Features are shown in the below screenshots:

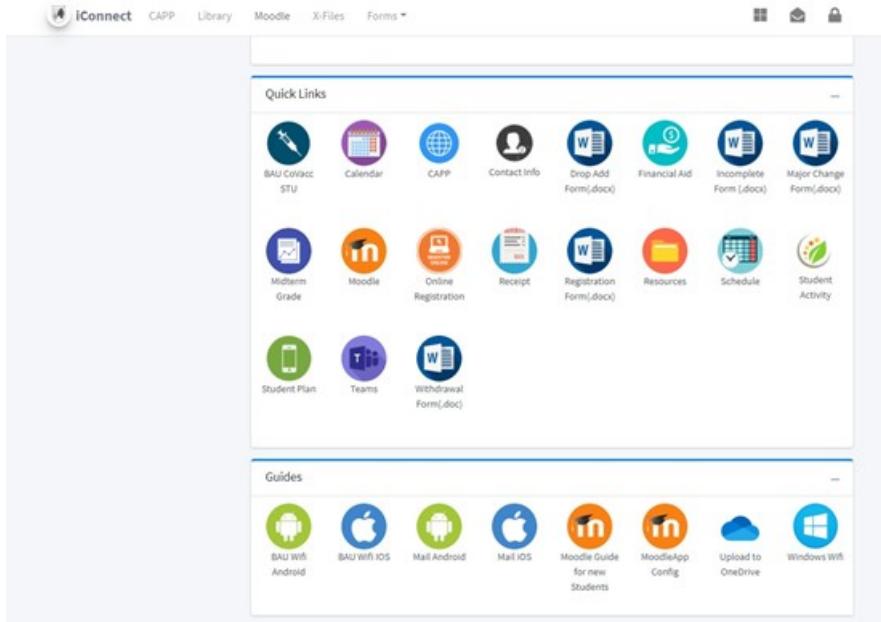


Figure 1.10: BAU iConnect App

Accessing one of the features:

LIBRARY

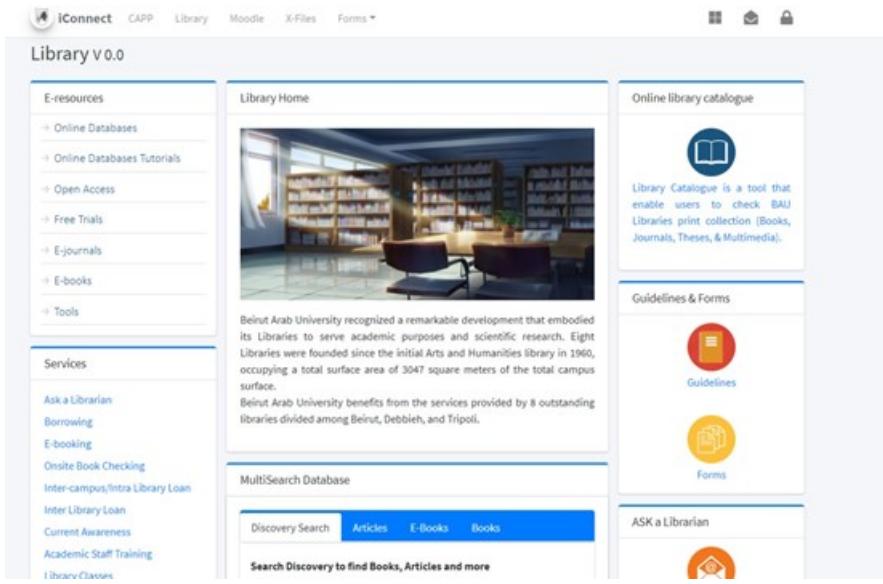


Figure 1.11: BAU iConnect App Library Section

With BAU's iConnect Portal, you will be able to:

- Staff and students can exchange and download files and documents.
- Academic staff and students can open discussions and obtain feedback and replies.
- The portal is a site of exchange for general and specific announcements for BAU's community.
- Students use the iConnect to view grades. Academic staff can insert grades, extract class rosters, obtain reports for students' academic paths, and perform other related academic tasks.
- Midterm and Final Exam results are published on iConnect.
- Students may use X-files to view their academic, financial data, profile, warning, probations, etc.
- Staff and students can benefit from library services including search and retrieval of online and print books, journals, and articles using the internal library database and online database.

1.6.5 Stanford University Portal

The Online Portal [8] is created for formal and prospective students of the University to create an account or log in to perform certain academic actions at ease e.g. Course Registration, Fees Payment, Authority to Pay, Check Result, View Admission List, Acceptance Fees Payment Details, Transcript, View Academic Calander, Extra Credit Hours, Deferment of Admission etc...

The student portal at Stanford University provides many services and information by which it eases the student's life at the university.

So, there are many services provided:

- What was important is that it links to university systems by which it allows students to access frequently used services from one place using one login.
- Also, it links to useful information in different areas, such as academic advising and resgistration, services provided by library, scholarships, student services, etc...

So, mainly the student portal at Stanford University is beneficial for personalized information and online services all in one place.

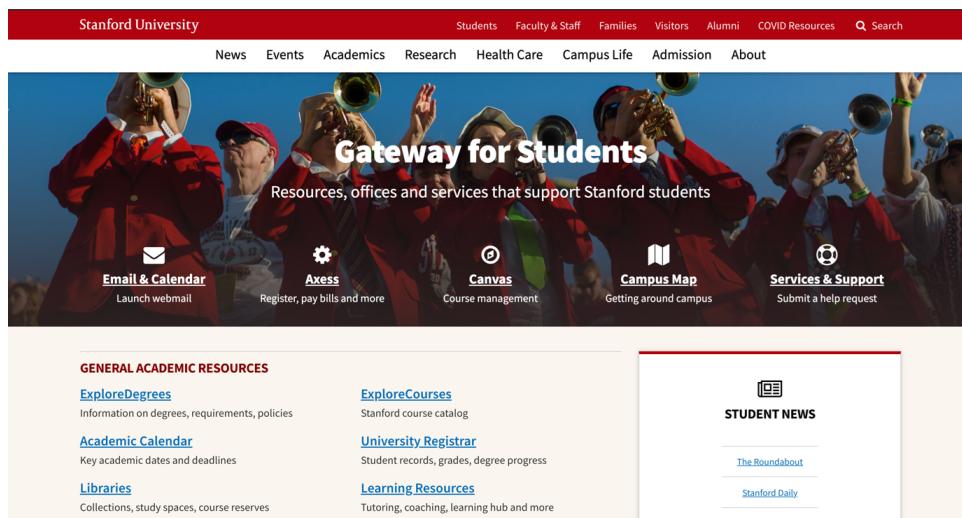


Figure 1.12: Stanford Student Portal Homepage

Fig. 1.12 represents the general academic resources at Stanford University

The screenshot shows the Stanford Student Portal Academics page. At the top, there's a red header bar with the Stanford University logo and links for Students, Faculty & Staff, Families, Visitors, Alumni, COVID Resources, and a search bar. Below the header, a navigation menu includes News, Events, Academics, Research, Health Care, Campus Life, Admission, and About. The main content area is divided into several sections: 'GENERAL ACADEMIC RESOURCES' (ExploreDegrees, ExploreCourses, Academic Calendar, Libraries, Stanford Bookstore), 'FOR UNDERGRADUATES' (Undergraduate Education, Explore Majors), and 'FOR GRADUATE STUDENTS' (Vice Provost for Graduate Education, Graduate Life, Postdoctoral Affairs). To the right, there are two boxes: 'STUDENT NEWS' (The Roundabout, Stanford Daily, Notes from the Quad) and 'SAFETY & SUPPORT' (Public Safety, 5-SURE Escort, Sexual Assault Support & Resources).

Figure 1.13: Stanford Student Portal Academics Page

The screenshot shows the Stanford Student Portal Explore Majors page. At the top, there's a red header bar with the Stanford University logo and a SUNetID Login link. The main title is 'UNDERGRAD | Majors'. Below the title, there's a 'EXPLORE MAJORS' section with links for Majors A-Z, Majors by Interest, News, and More Ways to Explore. A boxed statement says: 'DON'T BE AFRAID TO DECLARE! Sometimes a good way to evaluate the major or minor is to "try it on"—declare, integrate yourself into the department, and see if it's the right fit. You can certainly change majors if you later realize a different field is a better fit for you.' Below this, there's a button labeled 'FIND OUT WHEN AND HOW TO DECLARE A MAJOR, PLUS ADDITIONAL TIPS' and a link to 'LEARN MORE ABOUT THE MAJORS SITE'. On the right, there's a 'NEWS & ANNOUNCEMENTS' section with three items: 'CS+X pilot to be discontinued end of spring quarter' (JAN 2019), 'New Minor Subplans for the Human Biology Program' (JUL 2018), and 'New Minor in Digital Humanities' (JUL 2018). There's also a link to 'READ MORE MAJORS NEWS'.

Figure 1.14: Stanford Student Portal Explore Majors Page

Fig. 1.14, In the boxed statement, it helps students find their best fit majors according to their interests and their skills. It is easy to change majors if later a student realizes a different field is a better fit for him.

Figure 1.15: Stanford Student Portal Career Education Section

Fig. 1.15, In the Career Education section, it is implemented to guide the students in their career paths, and as seen in the below screenshot, it can be done in different ways, and one of them is Stanford Alumni Mentoring which connects students with Alumni's.

Figure 1.16: Stanford Student Portal Services Page

Here, also, are some of the services that are found in the student portal at

Stanford University: Campus Map, Student Financial Services, Student Technology services, Student housing... .

The screenshot shows the Stanford University mobile application interface. At the top, there is a red header bar with the university's name and a search bar. Below the header, there is a navigation bar with links for News, Events, Academics, Research, Health Care, Campus Life, Admission, and About. The main content area is divided into several sections:

- HOUSING AND DINING**
 - [Residential & Dining Enterprises](#): Providing student housing and dining.
 - [Dining Halls](#): Dining locations and hours.
- GETTING AROUND**
 - [Campus Map](#): Searchable online campus map.
 - [Marguerite Shuttle](#): Campus shuttle routes, schedules.
 - [Parking & Transportation](#): Parking permits and commute programs.
 - [Caltrain](#): Train schedules and stops.
- MANAGING FINANCES**
 - [Financial Aid](#): Application requirements, forms and deadlines.
 - [Student Financial Activities](#): Guide for student employees, travel reimbursement and more.
 - [Student Financial Services](#): Manage your university bill.
 - [HEOA Consumer Information](#): Consumer information for students.

The screenshot shows the Stanford University mobile application interface. At the top, there is a red header bar with the university's name and a search bar. Below the header, there is a navigation bar with links for News, Events, Academics, Research, Health Care, Campus Life, Admission, and About. The main content area is divided into several sections:

- INFORMATION TECHNOLOGY**
 - [Student Technology Services](#): Tech support just for students.
 - [Stanford Mobile](#): Stanford's official mobile app.
 - [Computing & Communications](#): A getting started guide for students.
 - [Accounts](#): Manage SUNet ID, password, two-step and more.
- SCHOOLS**
 - Business
 - Earth, Energy & Environmental Sciences
 - Education
 - Engineering
 - Humanities & Sciences
 - Law
 - Medicine
- DEPARTMENTS**
 - Departments A - Z
 - Interdisciplinary Programs
 - Research Centers A - Z
 - Interdisciplinary Research
 - Libraries
- HEALTH CARE**
 - Stanford Health Care
 - Stanford Children's Health
 - Stanford Online
- ABOUT STANFORD**
 - Facts
 - History
 - Accreditation
 - Undergraduate
 - Graduate
 - Financial Aid
- ONLINE LEARNING**
- ADMISSION**
- RESOURCES**
 - A - Z Index
 - Campus Map
 - Community Engagement
 - Directory
 - Stanford Profiles

Examining the previous related work of other university apps, we listed the features in the following table. We then aimed to include all the features in our AUB application provided the time constraints that we had. Literature review allowed us to have an idea about features that students might like in different universities and then use all these in one application to benefit AUB students.

Table 1.4: Comparing features with other university platforms

	Valencia College	UHGo	EPFL	BAU	Stanford	Our Application
All-in-one platform	✓	✓	✓	✓	✓	✓
Assignment reminder	✗	✗	✗	✗	✗	✓
Recommend events, workshops, etc...	✗	✓	✓	✗	✗	✓
View all academic entities in an organized manner	✓	✓	✓	✓	✓	✓
User can manually organize	✗	✗	✗	✗	✗	✓
Alumni participation	✗	✓	✗	✗	✓	✓
University map with shortest path	✗	only a University map	✓	✗	only a University map	✓
Student university guide	✓	✓	✓	✓	✓	✓
Recommend areas to study	✗	✗	✓	✗	✗	✓
Course page with syllabus and other info	✓	✓	✓	✗	✓	✓
Generate student schedule	✓	✗	✓	✓	✓	✓
How to guide	✗	✗	✓	✗	✗	✓
Supported by IOS and Android	web app	✓	✓	web app	web app	✓
Handling different screen sizes	✗	✓	✓	✗	✗	✓

Chapter 2

Design Process

2.1 Engineering Constraints

2.1.1 Technical

- System Testing constraint: The system in a worse case scenario should support the total number of AUB students, 8000 users, logged in simultaneously. But, it is impossible to actually test the system on such a number.
- System resolution constraint: The system should be supported as a mobile application and a web application at the same time.
- Data constraint: The recommender system is a machine learning system that requires a large dataset, typically more than 600 samples in the case of AUB, to get a relatively desired accuracy, greater than 70%. This dataset should include the list of courses that AUB students took along with their grades or specific user interest information. The data can be retrieved from university databases, excluding student's names, if we got an official acceptance from AUB. Otherwise, the data can be collected using a survey questionnaire which will be time consuming and not feasible.
- Privacy and data security constraints: The inability of the mobile application to access personal information from moodle like assignments and courses.

2.1.2 Non-Technical

- Time constraint: The whole system must be completed at the end of the spring 2022 semester.
- University acceptance constraint: The official acceptance of the university to use this platform especially that a lot of its aspects are university re-

lated and therefore require collaboration to provide us with the necessary information and databases for deployment.

2.2 Design Alternatives

2.2.1 Design Alternative 1

This is the desirable design that we are aiming to achieve. It includes a user friendly interface and an easy to use mobile application including links for all AUB online systems in one place and combining all the information that a student needs to know about AUB. Ideally, this mobile application has access to moodle, it can read the assignments from moodle's web page and use this information to send the user alerts on due dates.

Moreover, it has access to aubsis and all user-related information such as transcripts, registered courses, past schedules etc.. The design also includes a recommender system that is trained based on previous student data including the courses taken and the grades associated with each course. The recommender system also has access to the courses offered by AUB in every corresponding semester and the grades of every student on previous courses so that it can make the desired recommendation. As for the other workshop recommender system, it will have access to the workshops conducted by every club at AUB. Moreover, the application includes an interactive university map. The above functionalities of the application are highly dependent on AUB's acceptance to offer the desired data access needed to carry on the project.

As per the agile process we are following, we designed an initial prototype for the system design using the software tool figma, and we presented the following prototype, Fig. 3.5, to stakeholder's and got their feedback accordingly. Based on their feedback, we are still developing another prototype that is based on html and css languages and which can provide a clearer overview of the system to users.

2.2.2 Design Alternative 2

This design is considered as a plan B if the first implementation was subjected to the constraints discussed below.

At first, in case no access to moodle was granted, the application will prompt the user to input all the assignments he/she has for a given week. It will then send reminders based on that. Similarly, regarding the access to aubsis, if a user wishes to use the recommender system for courses functionality, he/she will have a special field to add the grades of past courses he/she took assuming the recommender system got successfully trained on anonymous data that includes courses along with the students grades in them.

Moreover, in case no access for such data was given the courses recommender system and the workshop recommender system will both be based on having the users input their interests. The data to train the model in such cases will be collected by issuing a survey questionnaire to AUB students to collect the courses they have taken along with their academic interests and what courses they preferred the most.

2.3 Design Decisions

To provide the best mobile experience, we relied on the following design decisions based on our previous design iterations and online feedback from other users.

2.3.1 React Native/Front-end

React Native is a platform that creates a hierarchy of user interface components from which JavaScript code is generated. It comes with a set of features for both Android and iOS platforms that may be used to create a native-looking mobile app. React Native allows you to build real and interesting mobile apps using only JavaScript, and it works on both Android and iOS platforms [9].

Key advantages of using React Native are that:

- It provides a live reload on every save.
- It allows developers to see their changes without waiting for them to be saved.
- Developers can benefit from advanced JS engine known as Hermes.
- It shortens the time it takes for the app to become interactive.
- Significant portions of a current web client can be reused for new mobile applications.

We looked for an ideal platform to develop our mobile app, and React Native was the ideal choice. It boasts a simple, smooth, and responsive user interface that significantly minimizes load time. Additionally, React Native apps are known to be faster to develop than native apps, without losing quality or performance [10].

2.3.2 Flask/Back-end

Flask is a popular web framework and a Python library that simplifies the creation process of web applications. It has a simple and extensible core: it is a micro-framework without an ORM (Object Relational Manager) or other things like that [11].

Key advantages of using Flask Framework are that it offers:

- Better adaptability.
- Better compatibility with cutting-edge technologies.
- Great scalability for simple web apps
- Considerably improved framework performance.
- Technical experimentation.
- Usage Simplicity.

We chose to use Flask because it decreases development time and helps programmers to develop faster and smarter. Despite the lack of a significant release, many programmers have adopted it, demonstrating its utility. Flask is a relatively new framework that draws on previous frameworks and has shown to be great for smaller applications while still having the ability to scale [12].

2.3.3 Database MySQL

The main purpose of our application is facilitating students' university lives and providing them with all their needed data. Therefore, having database files, storing in them, searching in them, and extracting information from them is very crucial and essential.

For our application, we choose to work with MySQL server for several reasons:

- One of the most effective database management software: from the top 25 best databases management softwares.
- Easy to set up from scratch, user friendly interface.
- Adjustable for heavy applications.
- Free cost

- High availability, scalability, and security.
- Team members are familiar with it.
- Supported by Flutter.

2.3.4 User Interface

Based on the feedback from the UIF team and our previous design iterations, our final prototype design can be found in the following link (...). This design is the one we used in our fully functional application.

2.4 Design Iterations

- Implementation wise:

In the middle of last semester, we started our first design implementation using flutter as our frontend application development tool. Flutter is a tool that uses the DART language for frontend development of IOS and android supported devices. After developing some of our initial features like the login page, welcome page and courses page and starting with our map feature, we noticed that flutter does not support map features. We researched more about the issue and decided to shift to another ios and android supported mobile development kit, which constituted our second design iteration.

- Second design iteration:

We shifted to using react native and implemented our frontend features again using Javascript, the language used by react native. As for the backend part, we started working on the backend using nodejs, which is an open source server environment and mongoDB, which is a NoSQL database program as our database.

Working on the backend, we realized that mongodb is being slow and requires high internet speed. With the constraint of having slow wifi, we shifted to MYSQL database which stores data locally and Flask web framework as our server. This shift in backend constitutes our third design iteration.

As for the user interface design and prototype, we also went through several design iterations.

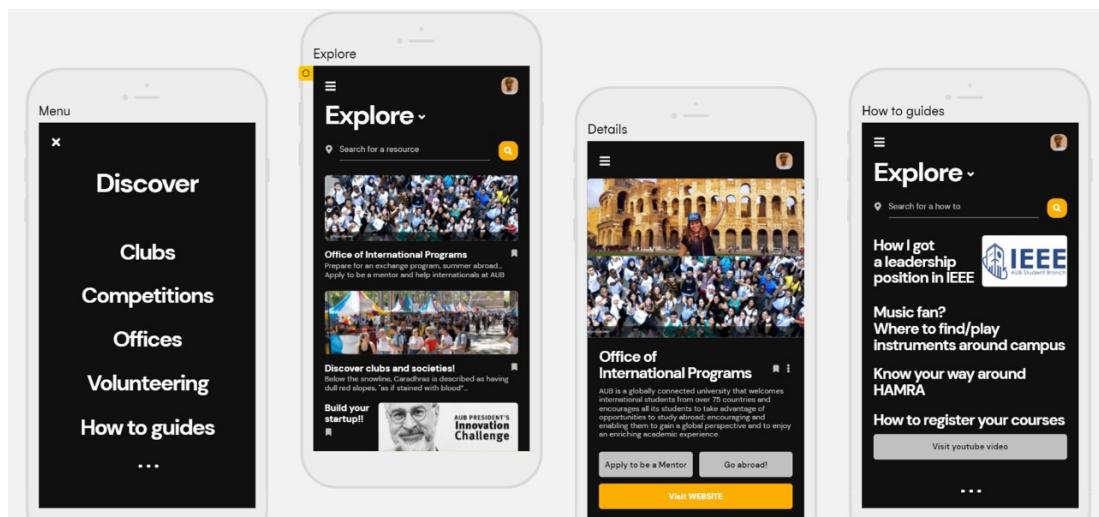
Which are found in the implementations section too (to avoid repetition, here is a reference 3.0.1)

The first step in implementing the mobile application was designing an initial prototype which helped in updating the system preferences. In fact,

our first prototype was a first and preliminary version of our app development. We had to release and show our sample to evaluate the progress of our design, to enhance precision, by students and alumni.

As expected, we got a lot of feedback all of which gave their opinions that illustrates working on other features and implementing a more effective one. We really needed those feedbacks from students to track our model. So, mainly, in our first prototype, we included several tasks, which are shown above under each figure. So, we intended to include UI page, a home page that displays news, recommended workshops, clubs, etc... as well we included a page for courses info that represents the courses registered, grades, and quick links to other pages related to student information, also it displays info about the course wanting to take, course syllabus, and the professor teaching the course. Based on these features, students gave their feedback which was classified between what is set to go and what needs to be modified or added.

Finally, they suggested to include a guide for tasks at AUB within video links, some of which guide how to register courses (mainly for new students), clubs, know your way around campus and Hamra, and many other guidelines. All their specified features are emphasized in below figure:



After getting feedback from the students and the UIF team, we developed the following interactive prototype. However, after getting feedback again from the FYP presentation last semester, we were recommended not to use a recommender for courses. So, we decided to remove this feature. Our final prototype, the one used for the final implementation can be accessed

through the following link: [Click Here](#)

It includes all the features previously listed and was designed by the support of a graphic design student from the UIF team at AUB.

2.5 Standards

The IEEE standards are as follows:

- [13] IEEE/ISO/IEC 26515-2018 - ISO/IEC/IEEE International Standard - Systems and software engineering - Developing information for users in an agile environment [\[Link\]](#)
- [14] IEEE/ISO/IEC 12207-2017 - ISO/IEC/IEEE International Standard - Systems and software engineering – Software life cycle processes [\[Link\]](#)
- [15] IEEE P7002, Data Privacy Process: The following standard represents requirements for software engineering processes that includes privacy oriented applications in terms of products, services, and systems utilizing employee, customer or other external user's personal data [\[Link\]](#)
- [16] IEEE P7006, Standard for personal data artificial intelligence (Agent): This standard outlines the technical aspects needed to develop and give access to a personalized Artificial Intelligence (AI) that includes inputs, learning, ethics, rules and values controlled by individuals [\[Link\]](#)

Chapter 3

Implementation

3.0.1 Prototype Design

The first step in implementing the mobile application was designing an initial prototype which helped in updating the system preferences. In fact, our first prototype was a first and preliminary version of our app development. We had to release and show our sample to evaluate the progress of our design, to enhance precision, by students and alumni.

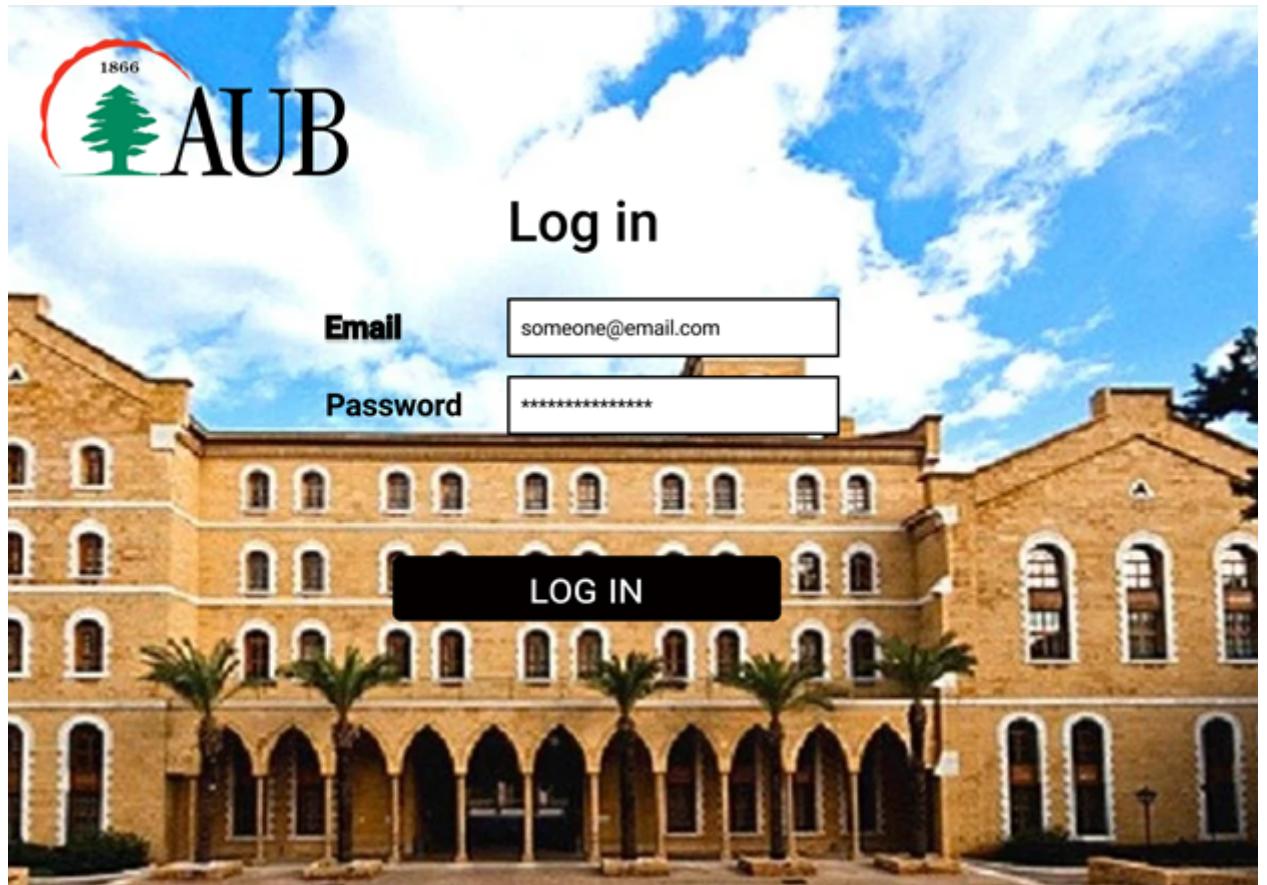


Figure 3.1: Prototype Log-in Page

Fig. 3.1, The user logs in to the website/application using his/her AUB credentials

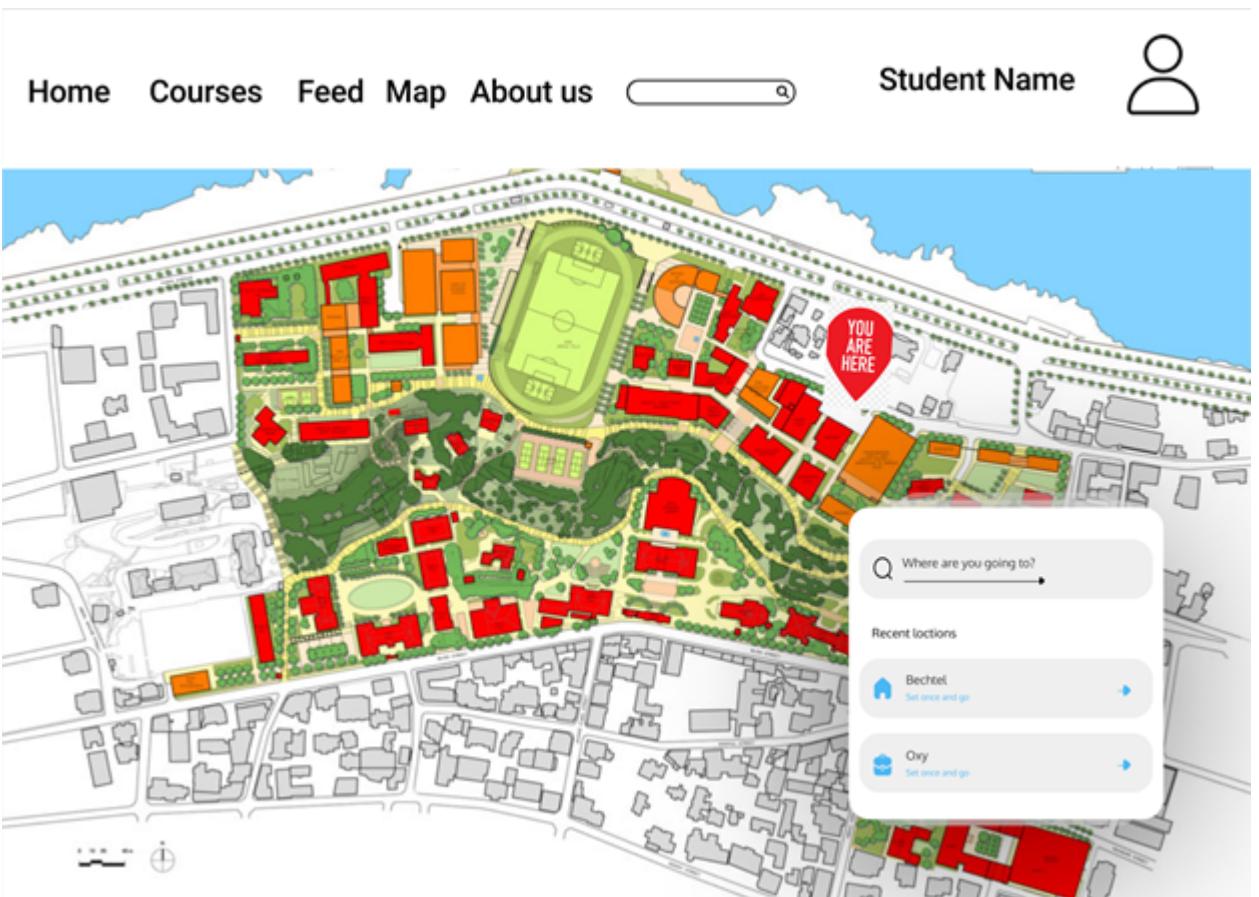


Figure 3.2: Prototype Map Page

Fig. 3.2, The map page is made especially for new students in order to reach specific points on campus faster



Recommended Workshops



VIEW ALL

News



VIEW ALL

Figure 3.3: Prototype Home Page

Fig. 3.3, The Home page contains all the news and recommended workshops that the student desires

Home > Courses



Courses Registered

Title
Author 1, Author 2

Web Statement of Fees

[View Degree Evaluation](#)

[View Academic Transcript](#)

Figure 3.4: Prototype Courses Page

Fig. 3.4 represents the courses registered, grades, and quicklinks to other pages related to student information

Figure 3.5: Prototype Course info Page

Fig. 3.5 displays the page info about the course wanting to take, course syllabus, and the professor teaching the course

After finalizing the prototype, we went back to our interviewees to collect their feedbacks and fortunately we gathered positive feedback by which students were enthused by having such helpful app that can manage their life at AUB. Not to mention that the final design will be modified by help of graphic designers recommended by UIF team. And Below is the link to our finalized prototype: [Link]

3.0.2 Real Code Implementation

After finishing the final prototype, we got a feedback from our fyp committee, and we started our real code implementation. We divided our implementation into several stages in the following way:

Stage1: Models creation

We started by drawing a diagram showing all the needed models in our app and the relations between them. We created then a new schema in MySQL and inside this schema we constructed a table for each model by defining classes in flask framework. Each table is designed in a way that satisfies the key requirements and constraints of each model.

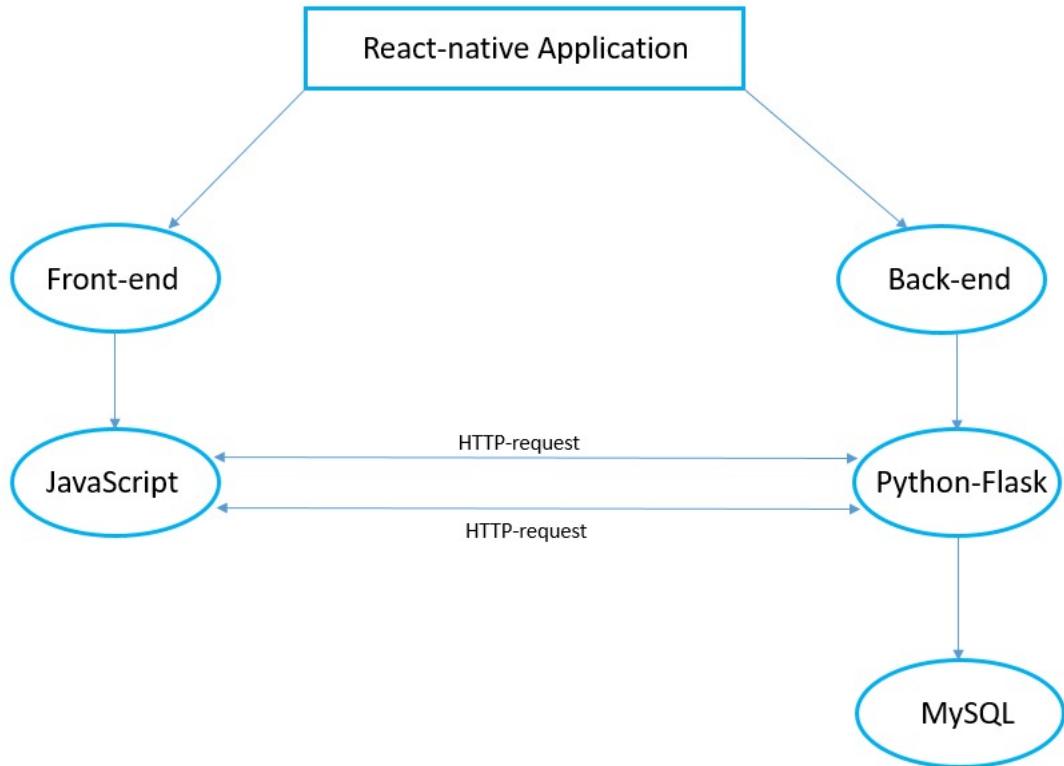
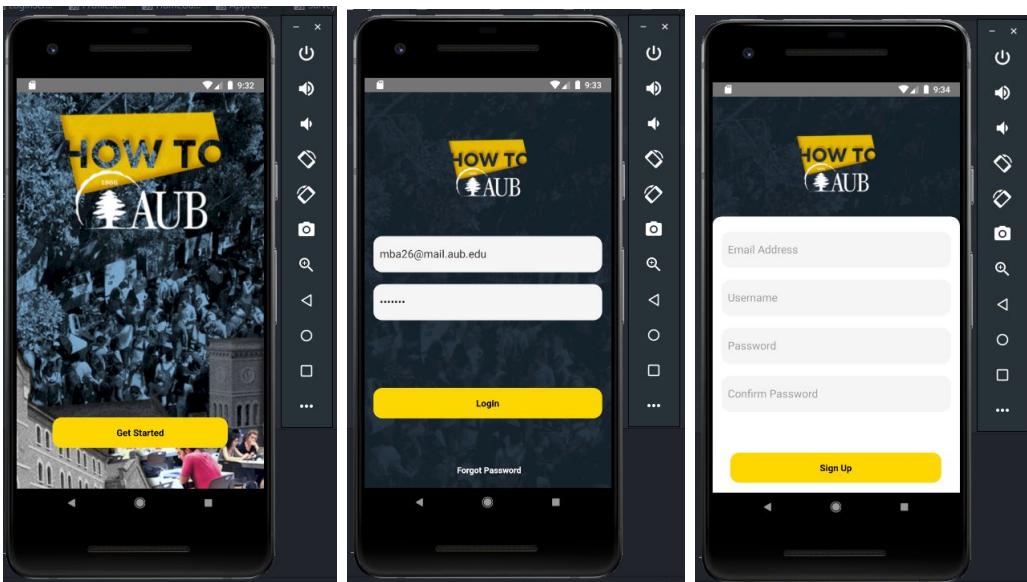


Figure 3.6: System Diagram

Stage2: Cover/Login/Sign up

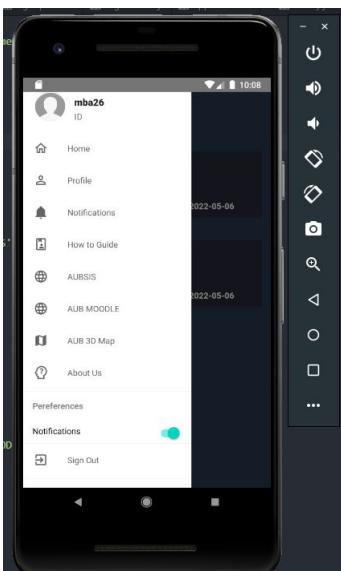
After finalizing the database design, we started implementing the components and the screens of our app. The first 3 pages we implemented were the cover page, the sign up page, and the login page. For each page, we worked in parallel:

some of us for the front-end and the others for the back-end. We designed the pages similar to what we did in the prototype, included navigation between the 3 pages, some validation for the input forms, and we defined back-end methods for getting and fetching the right data.



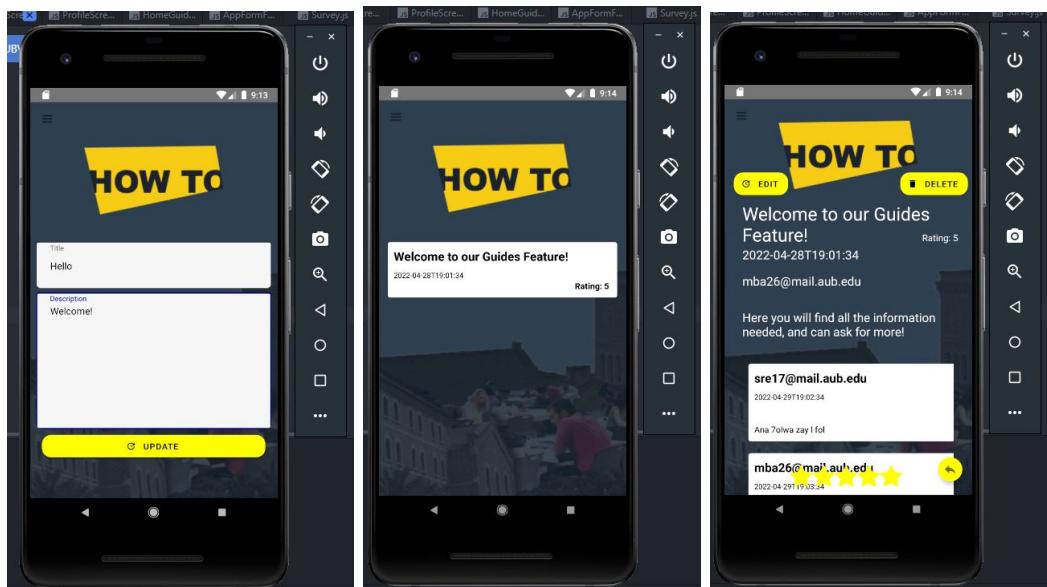
Stage3: App Drawer

In order to make our users access all the app features easily, we decided to create an app drawer that can be available in all the app pages. This drawer includes navigation to all the app features (aub-sis, aub-moodle, how to guide, notifications, my calendar, profile, settings...)



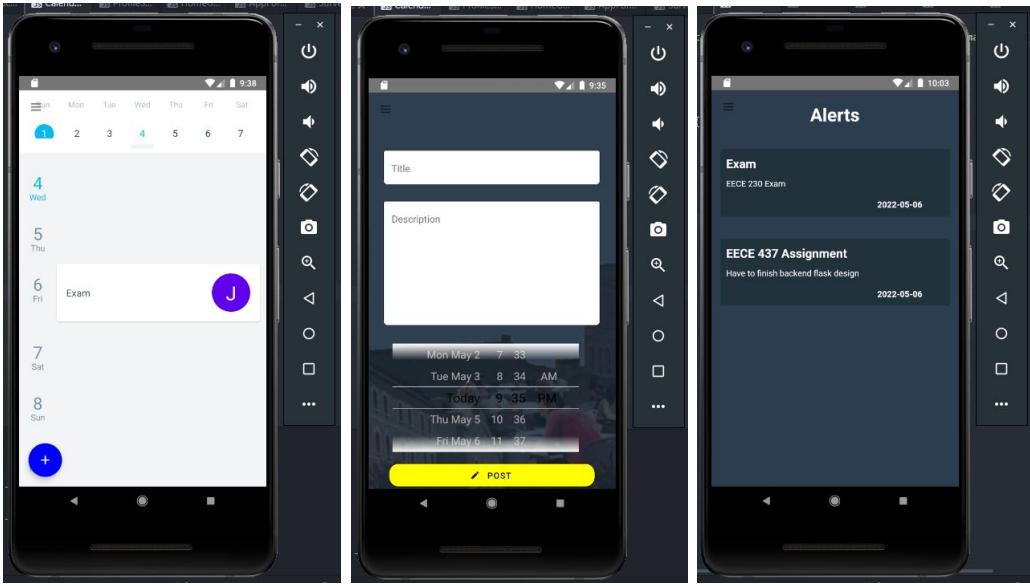
Stage4: How-to-guide

The how-to-guide section includes many features like: students forum, clubs, courses, recommended study areas. For the students forum, we implemented a page in which users can post their questions and get replies from others. They can also rate any post based on the 5 stars method, edit it, or delete it. For the clubs and the courses pages, we implemented a table that includes all aub clubs/courses and their CRNs, and by clicking on any club/course we can go to a more detailed page showing title, description, images, and many other information. For the study areas page, we also created a page in which all the aub study areas are displayed in the format of a Flatlist with some details.



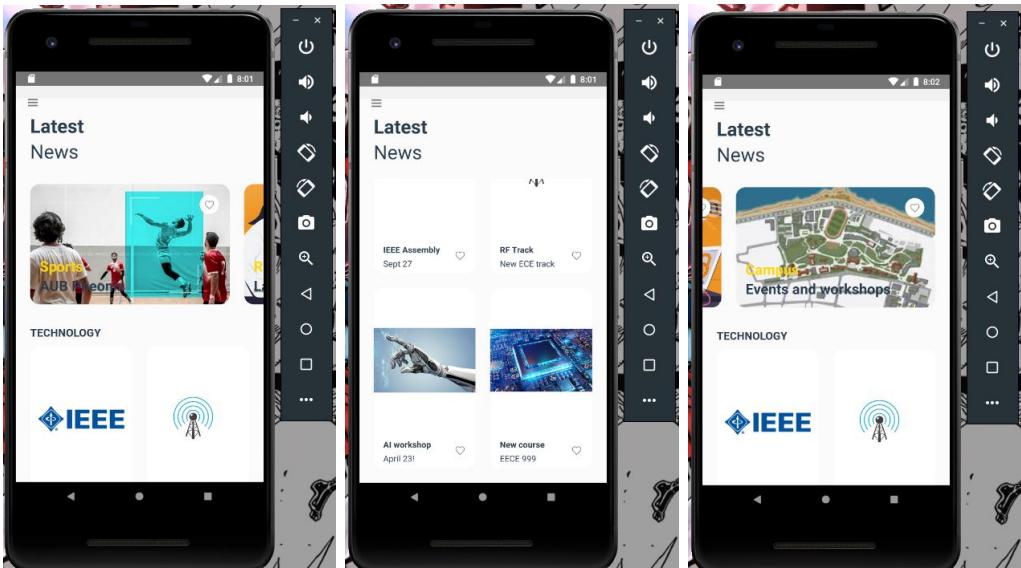
Stage5: Calendar/Notifications

To implement a calendar, we relied on a built-in calendar available in react-native. We reused the code and changed based on our needs. Users can add their assignments deadlines and the events they wish to attend so that they receive reminders on them later on. These reminders are shown as notifications in the alerts screen.



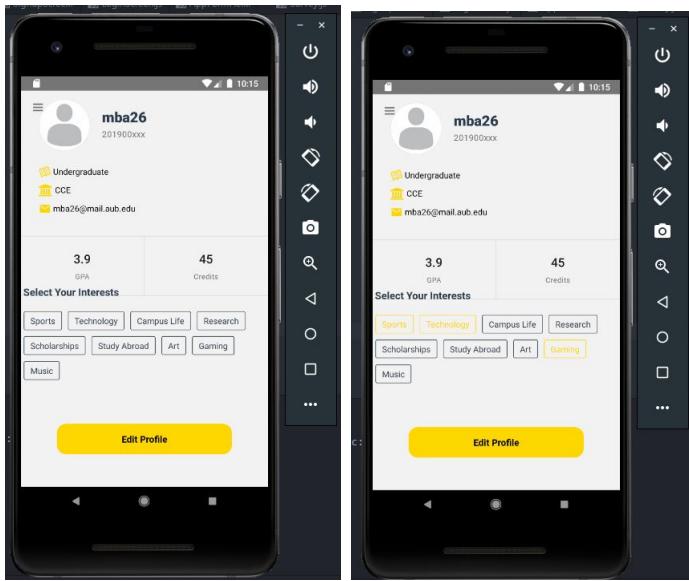
Stage6: Home page

The home page is the first page that appears to the user after logging in. It includes all the latest news about AUB with some general info like workshops and events based on the user preference.



Stage7: Profile page

This page includes many information related to each user: user-name, aub-id, gpa, class, major, interests, and others. Users can check their their personal info and edit them after being logged in.



Stage8: Admin side

After finishing everything related to the user side, we implemented a simple website using html/css and python for the admin. Many admins can exist, each one can be responsible for deleting/adding/updating data for one feature or more. Admins can login through their email accounts and their user-names always start with the sub-string "admin".

The screenshot shows a web browser window with the URL 192.168.1.16:3000/admin/login. The page title is "Admin Page". It features a login form with fields for "Email" and "Password", and a "Log In" button.

Admin Page

Email:	<input type="text"/>
Password:	<input type="password"/>
<input type="button" value="Log In"/>	

The screenshot shows a web browser window with the URL 192.168.1.16:3000/admin/user. The page title is "Admin". It displays a table of users with columns: Id, User Email, User Name, Hashed Password, and Done Survey. There are four users listed.

	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	List (4)	Create	With selected▼		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Id	User Email	User Name	Hashed Password	Done Survey
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	mba26@mail.aub.edu	admin1	\$2b\$12\$JrmnILTVu8wwaDKzJArLOO5Mg8d6Hn0.dnluHDVtJc7y1By01BqG	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	sre17@mail.aub.edu	admin2	\$2b\$12\$cISXpoxHnBKnfJ2dGENWXur1GCJ/tlyMjw.Hk183CMIU6S16g/lge	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3	dmy06@mail.aub.edu	dmy06	\$2b\$12\$cISXpoxHnBKnfJ2dGENWXur1GCJ/tlyMjw.Hk183CMIU6S16g/lge	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4	jdr00@mail.aub.edu	jdr00	\$2b\$12\$cISXpoxHnBKnfJ2dGENWXur1GCJ/tlyMjw.Hk183CMIU6S16g/lge	<input checked="" type="checkbox"/>

The screenshot shows a web browser window with the URL 192.168.1.16:3000/admin/user/edit/?id=3&uri=%2Fadmin%2Fuser%2F. The page title is "Admin". It displays a form for editing a user with fields: User Email, User Name, and Hashed Password. There is also a "Done Survey" checkbox.

List	Create	Edit	
User Email	<input type="text" value="dmy06@mail.aub.edu"/>		
User Name	<input type="text" value="dmy06"/>		
Hashed Password	<input type="text" value="\$2b\$12\$cISXpoxHnBKnfJ2dGEI"/>		
Done Survey	<input type="checkbox"/>		
Save	Save and Add Another	Save and Continue Editing	Cancel

Admin
User
Club
Course
Prerequisite
Forum
Reminder
Forum Reply
Study
Logout

List (15)
Create
With selected▼

<input type="checkbox"/>	Course Id	Course Crn	Course Name	Course Description	Course Dept
<input type="checkbox"/>	Calculus and Analytic Geometry III	10111	MATH201	Multivariable functions, partial derivatives, cylindrical and spherical coordinates, multiple integrals, sequences and series, and integration in vector fields	MATH
<input type="checkbox"/>	Introduction to Engineering and Architecture	10131	FEAA200	The course is designed to familiarize first year students with the different disciplines in Engineering and Architecture including: Architecture, Civil, Mechanical, Electrical, Chemical, Industrial and technologies used in the fields. The course takes a unique interdisciplinary approach to the field and introduces the related disciplines in the world of engineering and architecture. One key objective is to promote interdisciplinary interaction and innovative thinking. The course is organized into modules covering the different disciplines within the Maroun Semaan Faculty of Engineering and Architecture (MSFA). The last module of the class showcases interdisciplinary projects demonstrating interactions among the different fields. The lectures explain as applicable to each discipline, through examples, notions of problem solving, design thinking, process of invention and innovation, environmental and civic responsibility, and measures of success in aesthetics and performance. The course project is a key component of the course. It is interdisciplinary in nature bringing ideas and solutions from all disciplines in engineering and architecture. Annually.	EECE
<input type="checkbox"/>	Operating Systems	10134	EECE432	This course covers the principles of operating systems and systems programming. The	EECE
<input type="checkbox"/>	Introduction to Probability and Statistics	10135	STAT230	Display of data, properties of probability, methods of enumeration, conditional probability, and independent events; discrete and continuous univariate distributions, generating functions, independent random variables, and the central limit theorem.	STAT
<input type="checkbox"/>	Electric Circuits	10136	EECE210	A course on fundamentals of electric circuits: basic elements and laws, techniques of circuit analysis: node voltage, mesh current, Thevenin, Norton and source transformation; inductors, capacitors, mutual inductance and transformers; transient response of RC, RL and RLC circuits; steady state AC circuits; power calculations; circuit simulation using SPICE	EECE
<input type="checkbox"/>	Introduction to Computation and	10137	EECE230	This is an introductory programming course with an emphasis on abstractions and elementary algorithmic ideas. It uses the Python programming language. Topics include data types, selection, repetition, strings, lists,	EECE

192.168.1.16:3000/admin
Logout

List (10)
Create
With selected▼

<input type="checkbox"/>	Place Id	Place Name	Place Description	Place Image
<input type="checkbox"/>	1	Jafet	There are 3 places to study in Jafet Library. Each of those places are divided into different floors in the building. The ground floor is a silent room that fits a big number of students. The top floor is not a silent room, where students can study or chat together. Finally, the ground floor is a silent room where students can focus the most.	./assets/jafet.png
<input type="checkbox"/>	2	Oxy	There are multiple rooms to study in this building, such as the FYP rooms. There are also places to study at on the 3rd floor balcony, as well as the 6th floor (both indoors and outdoors).	./assets/oxy.png
<input type="checkbox"/>	3	Osb	In this building, there are many places to study in. Almost all floors above the ground floor have a place to sit and study, including mini-labs and lounge.	./assets/osb.png
<input type="checkbox"/>	4	Reynolds	This building has many places to sit and study. Almost all 6 floors have a places for students to sit and focus on his/her homework and exams. All while they can take a lunch break using the vending machines available :D	./assets/reynolds.png
<input type="checkbox"/>	5	Chemistry	The building features a huge library where students can sit and study all while they can take a break just outside the building and watch the greenery.	./assets/chem.png
<input type="checkbox"/>	6	West Hall	Students have the ability to study in a lot of places in this building, and since it has a lot of empty space, students can find many spread chairs and tables to sit and study.	./assets/westhall.png
<input type="checkbox"/>	7	Fisk Hall	One of the best buildings whenever students want to study and focus. This building has tables mounted on the walls with chairs facing those tables. Students want comfortable places to study? This is the go to building.	./assets/fisk.png
<input type="checkbox"/>	8	Bliss Hall	This building, just like the others, has many places for students to study at. The difference is that usually the labs in this building have air conditioning which benefits students especially during the summer.	./assets/bliss.png
<input type="checkbox"/>	9	Issam Fares	This building looks very uniquely constructed not just from the outside, but from the inside as well. It has many places for students to study and focus, and the labs in this building have a lot of high-end iMacs.	./assets/issamfares.png
<input type="checkbox"/>	10	Dwell	This place is found on the first floor in Bechtel Engineering Building. This is not a silent area, but students can still study there and have group discussions related to projects for example.	./assets/dwell.png

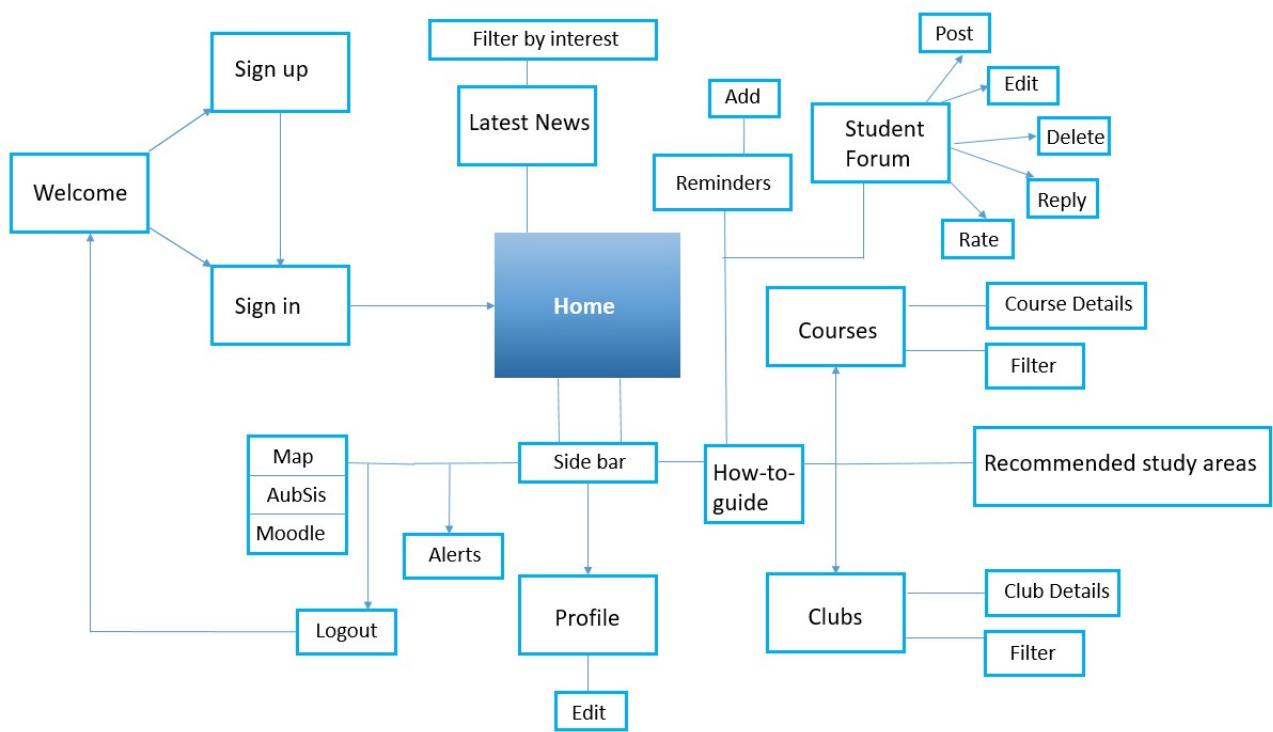


Figure 3.7: A diagram showing the workflow of the app features

Chapter 4

Experimental Setup and Results

4.1 Experimental Setup

4.1.1 Prototype Testing

After creating our prototypes and before starting implementation, the steps to test our requirements are as follows:

1. Interview multiple users
2. Collect all of the gathered information together and organize them
3. Deduce the new suggested prototype design/functionalities based on the users' feedback
4. Update the prototype

4.1.2 Back-end Testing

After finishing the implementation of each sub-task, all the back-end methods were tested to improve the quality of the code and the reliability of the implementation [17].

The process was done using unit testing which is one of the testing type that can be used in the software development field. It is supported by flask and tends to test each unit separately. A unit in python language means each smallest testable method of the application [18].

In flask, the unit testing can be performed by creating a specific class in which new methods are implemented to run our existed functions and expect their performance. The expectation can be done through comparing the returned output of the function and the actual expected output that can be passed manually to

the testing method.

The testing process was measured by measuring the coverage of the code. We kept on improving the testing methods and including more test cases till we got a coverage of 93

In addition to the unit-testing, we used postman (API platform) in order to test our get and post APIs.

4.2 Results

At the end of the implementation process, a survey was conducted with several students to know if the app features satisfy their needs. Below is a histogram that shows the survey results:

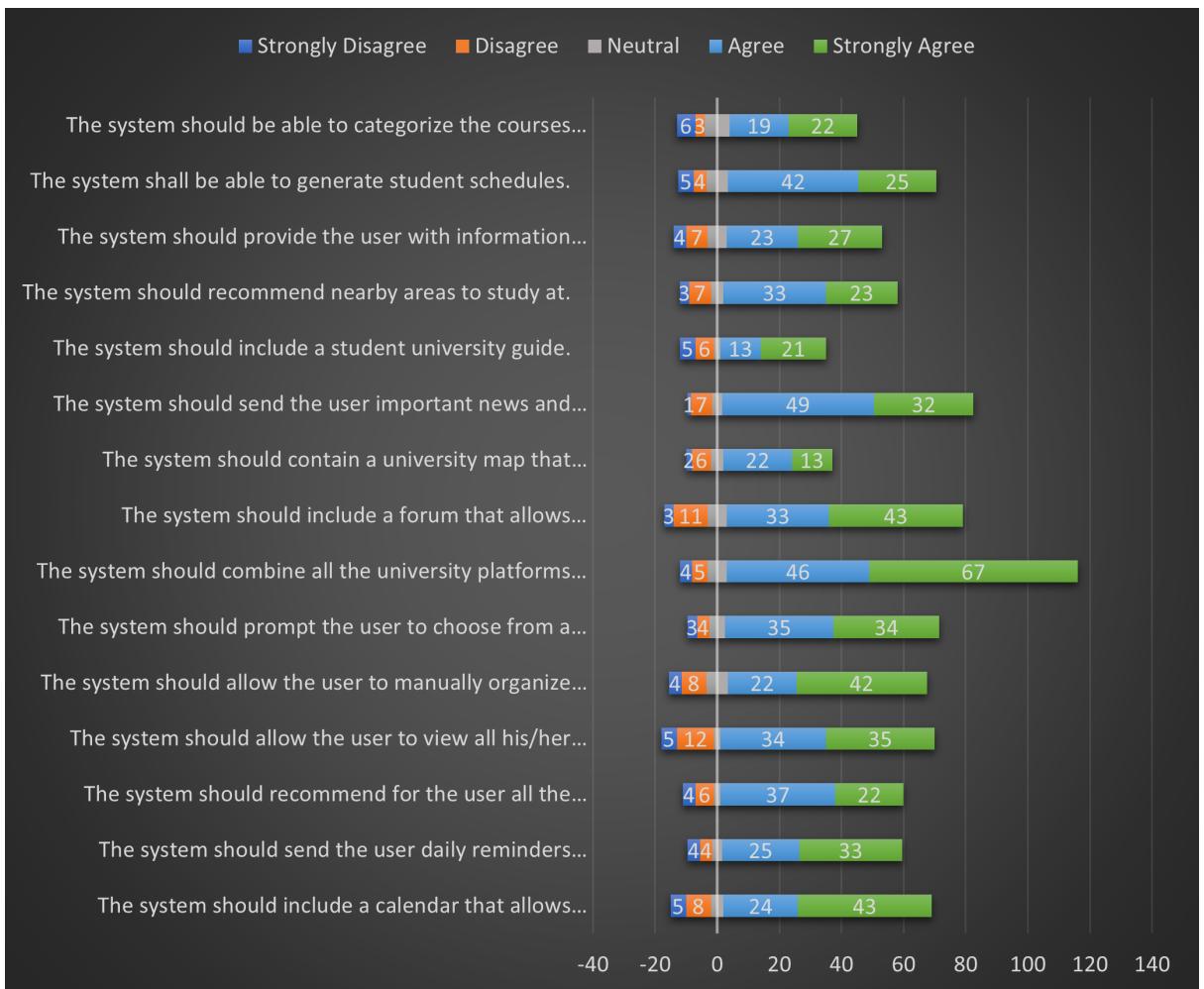


Figure 4.1: Survey Histogram Results

4.3 Discussions and Future Work

Regarding the future work, the application could be integrated with a chat platform for students. In addition to that, we are working on a project of AUBIT-COIN, which is a web app that allows AUB students to buy, sell, pay for aub services like vending machines and cafeteria through a digital community currency. We would like to integrate this feature in our application. Moreover, we would like the application database to be filled with original data rather than the dummy data that we created; this could be beneficial in case the application was actually deployed.

Chapter 5

Broad Impact: United Nations SDGs



Figure 5.1: SDGs

Our developed product ensures that students are able to study in an efficient manner. Our application satisfies two of the united nations sustainable development goals:



Figure 5.2: SDG4

- **SDG 4: Quality Education**

Developing a user friendly application for AUB mainly for the academic support of students, as the application is enriched with reminder features, accessing information about courses, helps improve the quality education at AUB. The application allows for access to a variety of resources at AUB in a friendly interface; this encourages students to contribute to clubs, research and guidance for other students. More specifically, the “research” section in the latest news screen allows students to know and get involved in the research being conducted at AUB, which has a positive impact on the quality of education.



Figure 5.3: SDG10

- **SDG 10: Reduced Inequalities**

As the application is available for all students equally, it allows for equal access and sharing of information between students. The “how to guide” feature is accessible for all students equally and allows for contributions from them. Therefore, combining aub’s resources in a centralized manner reduces the inequality of information access between students whereby students will be able to always know where to look for information.

Chapter 6

List of Resources and Engineering Tools

To provide the best mobile experience, we relied on the following design decisions based on our previous design iterations and online feedback from other users.

6.0.1 React Native/Front-end

React Native is a platform that creates a hierarchy of user interface components from which JavaScript code is generated. It comes with a set of features for both Android and iOS platforms that may be used to create a native-looking mobile app. React Native allows you to build real and interesting mobile apps using only JavaScript, and it works on both Android and iOS platforms [9].

Key advantages of using React Native are that:

- It provides a live reload on every save.
- It allows developers to see their changes without waiting for them to be saved.
- Developers can benefit from advanced JS engine known as Hermes.
- It shortens the time it takes for the app to become interactive.
- Significant portions of a current web client can be reused for new mobile applications.

We looked for an ideal platform to develop our mobile app, and React Native was the ideal choice. It boasts a simple, smooth, and responsive user interface that significantly minimizes load time. Additionally, React Native apps are known to be faster to develop than native apps, without losing quality or performance [10].

6.0.2 Flask/Back-end

Flask is a popular web framework and a Python library that simplifies the creation process of web applications. It has a simple and extensible core: it is a microframework without an ORM (Object Relational Manager) or other things like that [11].

Key advantages of using Flask Framework are that it offers:

- Better adaptability.
- Better compatibility with cutting-edge technologies.
- Great scalability for simple web apps
- Considerably improved framework performance.
- Technical experimentation.
- Usage Simplicity.

We chose to use Flask because it decreases development time and helps programmers to develop faster and smarter. Despite the lack of a significant release, many programmers have adopted it, demonstrating its utility. Flask is a relatively new framework that draws on previous frameworks and has shown to be great for smaller applications while still having the ability to scale [12].

All of the team members used the same softwares (React-Native, Flask, MySQL). We followed a pair programming strategy in our work. Below is a table that shows all of the assigned tasks distributed (3.0.2 Stages are available in details in the implementation chapter).

Task	Front End	Back End
Stage 1	Jad/Shaza	Dina/Mohamad
Stage 2	Jad/Dina	Shaza/Mohamad
Stage 3	Dina/Shaza	Jad/Mohamad
Stage 4	Mohamad/Dina	Jad/Shaza
Stage 5	Jad/Mohamad	Dina/Shaza
Stage 6	Shaza/Mohamad	Dina/Jad
Stage 7	Shaza/Dina	Jad/Mohamad
Stage 8	Dina/Jad	Shaza/Mohamad

Figure 6.1: A diagram showing the workflow of the app features

6.1 Github Repo

Lastly, to include a link to our FYP project repository: [Click Here](#)

Appendix A

Weekly Meeting Minutes

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

1	2/2/20	10 am <input checked="" type="checkbox"/>	15 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Dina Younes, Jad Raydan, Shaza El Fakih, Mohamad Abou Salem

Briefly summarize the main discussions during the meeting:

During the meeting, we told Dr. Hajj the following points:

- We will be using react native as a framework to implement our application.
- We met the UIF team and we agreed with them on a specific design to start with.
- We will start implementing the Welcome page, the Sign in page, and the how to guide feature.

Moreover, Dr. Hajj advised us to always keep him updated through using trello as a representation for our completed tasks.

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

After this meeting, we decided with Dr. Hajj to complete the implementation of our app and to focus on the above mentioned features.

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Dina	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Shaza	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Jad	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Mohamad	16/02/2022

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

2	2/7/20	10 am <input checked="" type="checkbox"/>	15 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Dina Younes, Jad Raydan, Shaza El Fakih, Mohamad Abou Salem

Briefly summarize the main discussions during the meeting:

During the meeting, we told Dr. Hajj the following points:
-Information about why and how to approach our how to guide and the app in general.
-We met the UIF team and we were provided a design to start with.
-Around 2 week deadline to implement our how to guide page design.
-We discussed moreover our updated trello activities and estimated deadlines.

Moreover, Dr. Hajj advised us to always keep him updated through using trello as a representation for our completed tasks.

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

After this meeting, we decided with Dr. Hajj to complete the implementation of our app and to focus on the above mentioned features.

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Dina	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Shaza	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Jad	16/02/2022
Working on the implementation of the Welcome, Sign in, and how to guide pages.	Mohamad	16/02/2022

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

3	2/16/22	10 am <input checked="" type="checkbox"/> 5 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El Fakih-Dina Younes-Mohamad Abou Salem-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We updated Professor Ali hajj on what we have done so far regarding the how to guide feature
- Professor Ali hajj is tracking our progress on trello
- We discussed facing a technical error on react native that took several days to be resolved

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good
- Backened Implementation is to be started

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
starting with the backend development of the how to guide feature+finishing a significant part of the frontend map feature	Dina	March 2
starting with the backend development of the how to guide feature+finishing a significant part of the frontend map feature	Mohamad	March 2
starting with the backend development of the how to guide feature+finishing a significant part of the frontend map feature	Shaza	March 2
starting with the backend development of the how to guide feature+finishing a significant part of the frontend map feature	Jad	March 2

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

4	2/23/22	10 am <input checked="" type="checkbox"/>	10 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El Fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We updated professor Hajj on what we did so far regarding the How to guides
- We informed him that the UIF team has provided us with new/updated designs for the how to guide feature and that we will be working on those updates
- We discussed using node.js for the backend development

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- our progress is good

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Dina	March 9
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Mohamad	March 9
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Shaza	March
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Jad	March 9

American University of Beirut
EECE 501 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

5	2/3/20	10:05 a <input checked="" type="checkbox"/>	15 minutes	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El Fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We updated professor Hajj on what we did so far regarding our progress in the app
- We discussed with Dr. Ali our meeting with the UIF team and other AUB professors about our discussion of adding a mentorship feature in our app (most likely a beta version till the app is fully functional)
- Dr. Ali explained how we should include our tasks in the sprint backlog and not only in the "working on section" in trello

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- good progress so far

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Dina	March 9
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Mohamad	March 9
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Shaza	March 9
Work on the updated frontend how to guide designs +Backend development of the how to guide feature+continue the map feature implementation	Jad	March 9

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

6	9/3/20	10:00 a <input checked="" type="checkbox"/>	10 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	all the team
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Attendees:

Shaza El Fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress on the backend development of the application
- Professor hajj informed us about the benefits of using online software development communities to solve certain errors and issues we face

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good
- The importance of open source and shared platforms

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Dina	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Shaza	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Mohamad	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Jad	25 March

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

7	3/14/22	10:00 a <input checked="" type="checkbox"/>	7 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	Jad Raydan
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Attendees:

Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress of our app
- Dr. Hajj advised us to work more and divide our features thoroughly on each of the team members

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- To progress faster to meet our deadlines of the sprint
- Update trello thoroughly

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Dina	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Shaza	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Mohamad	25 March
Work on the clubs page and home page/news feed+like option of how to guide and commenting	Jad	25 March

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

8	3/26/22	10 am <input checked="" type="checkbox"/>	7 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Dina Younes, Jad Raydan, Shaza El Fakih, Mohamad Abou Salem

Briefly summarize the main discussions during the meeting:

During the meeting, we told Dr. Haj the following points:

- We finished the profile page and the edit info page.
- We met the UIF team and we agreed with them on the implemented pages.
- We will start implementing the volunteering and the events pages.
- We will perform some validation for the login feature.

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

After this meeting, we decided with Dr. Haj to complete the implementation of our app and to focus on the above mentioned features.

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Working on the implementation of the volunteering page	Dina	01/04/2022
Working on the implementation of the events page	Shaza	01/04/2022
Working on performing some validation	Jad	01/04/2022
Working on performing some validation	Mohamad	01/04/2022

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

9	3/30/22	10 am <input checked="" type="checkbox"/>	10 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress with dr Hajj
- We explained our timeline and the remaining features

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Displaying news and workshops- Categorizing courses	Shaza	April 9
Displaying news and workshops- Categorizing courses	Dina	April 9
Displaying news and workshops- Categorizing courses	Mohamad	April 9
Displaying news and workshops- Categorizing courses	Jad	April 9

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

10	6/4/20	10 am <input checked="" type="checkbox"/>	10 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress with Dr Ali Hajj
- We explained our approaches with the app and how to be able to distribute the work and finish our app to meet our completion deadline

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Displaying news and workshops- Categorizing courses	Shaza	April 12
Displaying news and workshops- Categorizing courses	Dina	April 12
Displaying news and workshops- Categorizing courses	Mohamad	April 12
Displaying news and workshops- Categorizing courses	Jad	April 12

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

11	11/4/20	10 am <input checked="" type="checkbox"/>	12 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress with Dr Ali Hajj
- We explained our approaches with the app
- Discussed whether it's better to provide a demo or a video, and discussed more about the FYP presentation

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Display calendar for user to set reminders - Categorizing courses	Shaza	May 01
Displaying news and workshops - One time survey pop up for the user to select interests and can be changed later in the user profile	Dina	May 01
How to guide forum to post/delete/update and rate other user posts - Filter courses by dept name	Mohamad	May 01
View recommended areas and more details for the how to guides page	Jad	May 01

American University of Beirut
EECE 502 – Final Year Project
Course Coordinator – Dr. Youssef Tawk
Minutes for the Weekly Group Meeting – Submitted per Group



Meeting # Date: Time: Duration: Meeting called by: Minutes Taker:

12	4/20/22	10 am <input checked="" type="checkbox"/>	12 mins	<input checked="" type="radio"/> Advisor <input type="radio"/> Students	All the team
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Attendees:

Shaza El fakih-Mohamad Abou Salem-Dina Younes-Jad Raydan

Briefly summarize the main discussions during the meeting:

- We discussed our progress with Dr Ali Hajj the week before
- To work and finish our project on time Dr. Hajj decided not to have a meeting this wednesday
- A final meeting is to be scheduled next week for a progress update

Briefly summarize the conclusions drawn regarding the above-mentioned discussions:

- Our progress is good

Enumerate the assigned tasks by the FYP advisor for each student + the deadline for delivery:

Assigned Task / Per Student	Name of the Student	Deadline
Display calendar for user to set reminders - Categorizing courses	Shaza	May 01
Displaying news and workshops - One time survey pop up for the user to select interests and can be changed later in the user profile	Dina	May 01
How to guide forum to post/delete/update and rate other user posts - Filter courses by dept name	Mohamad	May 01
View recommended areas and more details for the how to guides page	Jad	May 01

Appendix B

FYP Poster

PROJECT 39- STUDENT RESOURCES PORTAL

Mohamad Abou Salem-Shaza El Fakih-Dina Younes-Jad Raydan

ABSTRACT

In recent days, the use of mobile applications in higher education institutions is advocated for a finer student experience. There is no mobile application for AUB students. Instead, AUB has multiple online systems, like aubsis, moodle, office 365 and the AUB website. Therefore, it is valuable to implement a system that provides centralized access to all those tools and supports both android and IOS.

PROBLEM DEFINITION

Based on a number of interviews conducted with multiple AUB students we got a clearer picture on the student's university needs; it came across that most students needed different forms of assistance including finding on campus class locations, getting guidance and feedback from other students, a platform for news and events and workshop announcements filtered by a student's interest and being notified for important deadlines. From here emerged the need to develop a system that can benefit AUB students in multiple aspects of their university life. Our aim was to develop a user friendly AUB students' application that provides ease of accessibility and mentorship for both new and old students.

For students, by students

IOS AND ANDROID COMPATIBLE

Scan for a demo of our application

QR code

IMPLEMENTATION AND TESTING

We implement the app using react native, frontend, combined with flask and mysql database as the backend.

We applied unit testing on the application functions and tested the backend functions using postman API. In addition we ran the application on Android and IOS emulators to test all the features.

CONCLUSION AND FINAL FEATURES

We provide a fully functional mobile application that includes following features.

- A combined access to aub platforms like aubsis and aub moodle.
- A university Map
- View courses, clubs and places to study
- Access to a guide forum with post and features
- News and events page filtered by a users' interest
- An admin page to provide control over the app
- Calendar containing deadlines with a send notification alerts feature

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