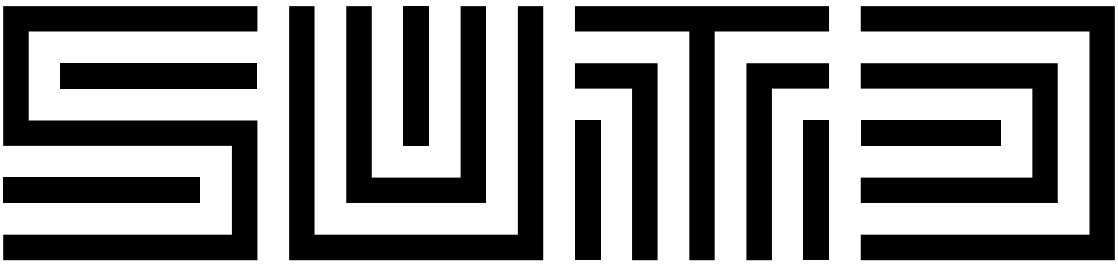


SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Cohort 02, Group 06

Improving Course Enrolment Process at SUTD

Author	Student ID
Kwok Keith	1006344
Jon Koo Jia Jun	1006388
Ryan Javier	1009501
Tristan Kwok	1009510
Quentin Lee	1009511

November 15, 2024

Contents

List of Figures

List of Tables

Nomenclature

GPA	Grade Point Average
IUROP	International Undergraduate Research Opportunities Program
SUTD	Singapore University of Technology and Design

1 Introduction

Boasting a student population of approximately 1,500, the Singapore University of Technology of Design (SUTD) is renowned for its interdisciplinary approach to education. However, for a university that prides itself in design, looking at any of its online resources would lead one to believe otherwise. Today, students, freshmen and seniors, still find the process of locating online resources confusing and frustrating. After extensive research, the team noted that two online resources stuck out to students when asked to evaluate an online resource of their choice, namely MyPortal and e-Dimension. Furthermore, the survey shows that users were more unsatisfied with MyPortal as compared to e-Dimension.

As such, the project will primarily focus on improving MyPortal, aiming to have a broader impact on student satisfaction with SUTD's online resources. When investigating student dissatisfaction when using MyPortal, course selection was identified as the most significant source of student dissatisfaction and will be the key area of improvement for this project. To elaborate, students expressed negative sentiments about the course selection process due to its unintuitive search interface, insufficient course information, and the anxiety caused by competition when trying to secure a spot in popular classes.

Firstly, the current search interface is unintuitive, as it requires students to remember course codes for enrolment, making the course selection process more difficult and inefficient. The current solution likely uses course codes instead of subject names to streamline backend processing, ensure consistency across the system, and avoid confusion caused by similar or overlapping course names. However, using module names alongside pillar (department) names would make the process more intuitive for students, allowing them to browse courses by their relevant pillar and easily find the specific courses they are interested in, without needing to memorise course codes.

Secondly, the current system lacks essential information that students rely on when selecting courses. For instance, there is no course rating system to help students make more informed decisions. Additionally, students often have to search pillar websites, like "istd.sutd.edu.sg," for critical details such as professor information and term offerings. This extra step of navigating external sites, without a centralised resource, leads to frustration during the course selection process. The current solution does not provide a single, comprehensive platform for all relevant course details, causing inefficiency and wasted time. By incorporating features like course ratings and centralised course information, students would gain valuable insights into course quality and availability, making it easier to select courses based on peer feedback and academic needs.

Moreover, students would benefit from knowing which courses and classes their friends are already enrolled in, as they often prefer attending classes together. Currently, they rely on direct communication, like Telegram, to meet this need. However, adding a social feature to MyPortal would make the course selection process more engaging and enjoyable. Without such features, students often find the system lacking the context and excitement they expect, making the experience frustrating and diminishing their confidence in selecting the right courses.

Lastly, students experience significant anxiety due to the competition for securing spots in popular classes, adding unnecessary pressure during the course selection process. The current system forces students to navigate an unintuitive interface, making them feel like they are battling the system under a time crunch when enrolment opens. This highlights the need for a user-friendly interface. The current solution does not alleviate this pressure, as students are required to search for and enrol in courses in real-time during the hectic enrolment window. A potential solution to reduce this anxiety would be to allow students to store and prioritise their course selections before the enrolment period, enabling them to pre-select their desired courses and avoid the stress of last-minute searches.

Therefore, there is a clear need to improve the course selection experience within MyPortal to make it more informative and user-friendly, ultimately enhancing students' overall academic experience.

The team hence defines the following problem statement for the project:

> **"How might we improve the usability of current course enrolment by providing ease of access to relevant information, an intuitive course search functionality and an easy way to deconflict their schedules?"**

This problem statement will guide the redesign efforts, ensuring that the solution directly addresses the key pain points experienced by students. Through this approach, the team aims to deliver a more intuitive and efficient platform that meets the needs of both freshmen and seniors.

The team proposes developing a course selection platform that provides students with the key information they need when enrolling. First, a search functionality that allows students to efficiently filter courses based on their preferences, aligning with their mental model. Second, a rating system to offer insights through student satisfaction ratings, professor feedback, and course difficulty. Third, a centralised platform that consolidates course information across all pillars, helping students review all necessary details before enrolment. Fourth, a "friend system" that enables students to see which courses and classes their friends are enrolled in, making the process more engaging. Lastly, a pre-selection feature to allow students to store and prioritize their courses before enrolment, reducing anxiety.

In summary, the proposed solution aims to streamline the course selection process, making it more intuitive, informative, and satisfying. The goal is to equip students with the tools and information they need to make informed decisions and reduce the anxiety associated with course selection. By incorporating a robust search function, a course rating system, and a comprehensive course summary, the platform will simplify the process and provide easy access to relevant information. Additionally, social features such as viewing friends' course enrolments will foster a sense of community, enhancing the overall user experience. Overall, the solution strives to meet student expectations, improve satisfaction, and simplify enrolment.

2 Solution

The proposed solution is a webpage designed to reimagine the course enrolment experience, addressing the limitations of MyPortal by offering a more intuitive, informative, and student-centred platform. The webpage will provide the key information that students need to make informed decisions during course enrolment. The following are the proposed features.

2.1 Search Functionality

At the core of the solution is a search functionality that allows students to filter courses based on their preferences, aligning with their mental model. Students will be able to search by course names, pillars (departments), professors, and other criteria, making the process intuitive and streamlined. The system is designed to be seamless and easy to use, enabling students to quickly find relevant courses without needing to memorise course codes or navigate complex filters.

2.2 Rating System

A course rating system will be integrated to provide students with valuable insights into the quality and difficulty of courses. This system will gather feedback from past students, including satisfaction ratings, professor evaluations, and course difficulty ratings. By accessing these ratings, students will be able to make more informed decisions, reducing the uncertainty and frustration often associated with course enrolment.

2.3 Centralised Course Information

The platform will consolidate all relevant course information across all pillars (departments) in one place. Instead of requiring students to visit individual pillar websites for details such as professor name and term offerings, all necessary information will be available within the platform. This centralised resource simplifies the enrolment process by providing students with the necessary information they need to know in one place, eliminating the inefficiency of external navigation.

2.4 Friend System

Recognising that students often prefer to attend classes with their friends, the solution will include a "friend system" that allows students to see which courses and classes their friends are enrolled in. This social feature not only makes the course selection process more engaging but also helps students coordinate schedules with their peers, enhancing the overall experience.

2.5 Pre-selection Feature

To reduce the anxiety of enrolling in popular courses, the platform will include a pre-selection feature. This will allow students to store and prioritise their course selections before the enrolment period begins. By pre-selecting their desired courses, students can avoid the stress of last-minute searches and rushed decisions during the enrolment window, ensuring a smoother and less stressful process.

2.6 Web App

The solution will be implemented as a web app, offering greater flexibility compared to a conventional mobile application. A web app ensures accessibility across multiple devices – desktops, laptops, tablets, and smartphones–without the need for platform-specific development. This also simplifies updates and maintenance, as changes are immediately reflected across all devices without requiring users to download app updates. Additionally, the larger screen real estate of a web app, particularly on desktops and laptops, allows for better presentation of detailed course information and complex search filters, further enhancing the user experience. In this project, the team will be focusing mainly on web apps used in the format of large screens, laptops and desktops, as most students would use their laptops for course selection.

One drawback of a web app compared to a mobile application is the lack of native mobile features, such as push notifications and offline access, which could help students stay informed regarding deadlines and updates. While web apps can offer push notifications, users may disable them due to their intrusive nature. A mobile application might provide a more personalised experience with native design elements. Nevertheless, the web app can be optimised for mobile through responsive design, ensuring that students have a smooth and consistent experience across all devices.

Despite these differences, the web app design remains the preferred choice for this solution. It offers greater flexibility, requires less maintenance, and provides an intuitive, feature-rich interface that meets students' needs during course enrolment. By ensuring seamless access across devices, the web app creates a consistent and user-friendly experience that aligns with students' preferences. This approach strikes a balance between ease of use and functionality, making it an ideal solution for improving the course enrolment process.

3 Target Users

Below are the target users

- **Primary Users:** Undergraduate SUTD students who need to register for courses
- **Secondary Users:** Non-graduating SUTD and exchange students
- **Supplemental Users:** Parents and friends of university students
- **Served Users:** University staff and faculty

3.1 Brainstorming Target Users

In order to understand the full set of users that will utilize the proposed solution, the team began by brainstorming target users (refer to Figure 1). These were illustrated in a Miro board where the team came up with wide range of users which were narrowed down into a list of primary, secondary, supplemental, and served users. Whiteboards helped differentiate each set of users' needs and wants (refer to Figure 2). While the needs of different sets of users did not vary significantly, it was important to make the distinction in order to fully gauge what use cases the application would have. Following that, 6 personas were created in order to get a diverse set of users from which three were chosen as primary personas, two for primary users and one supplemental user.

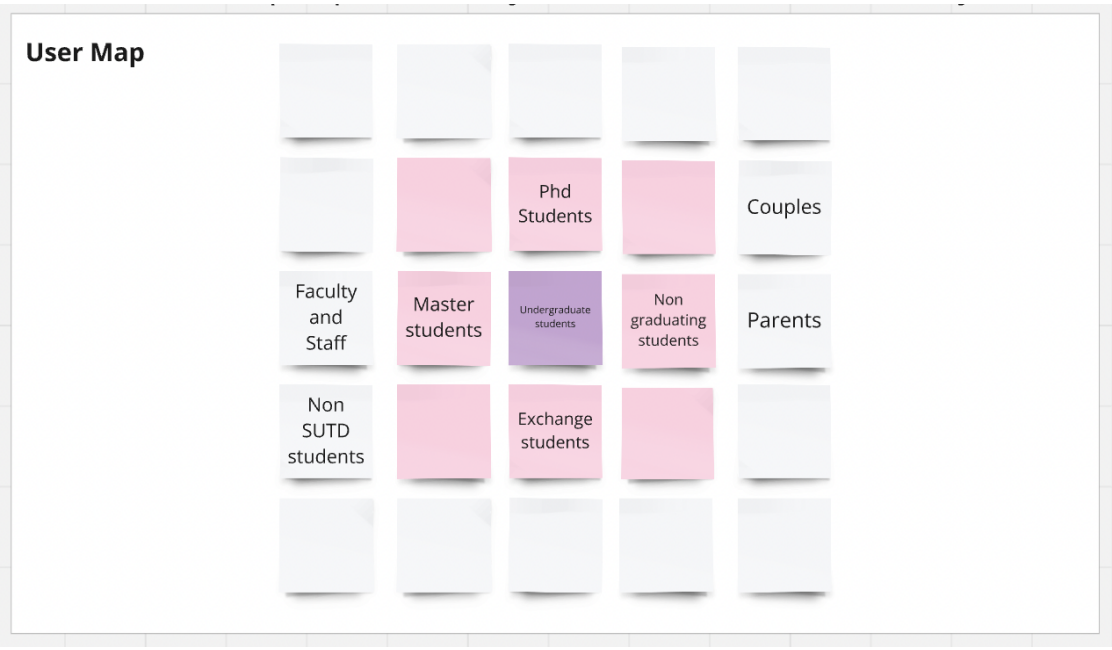


Figure 1: Brainstorming target users

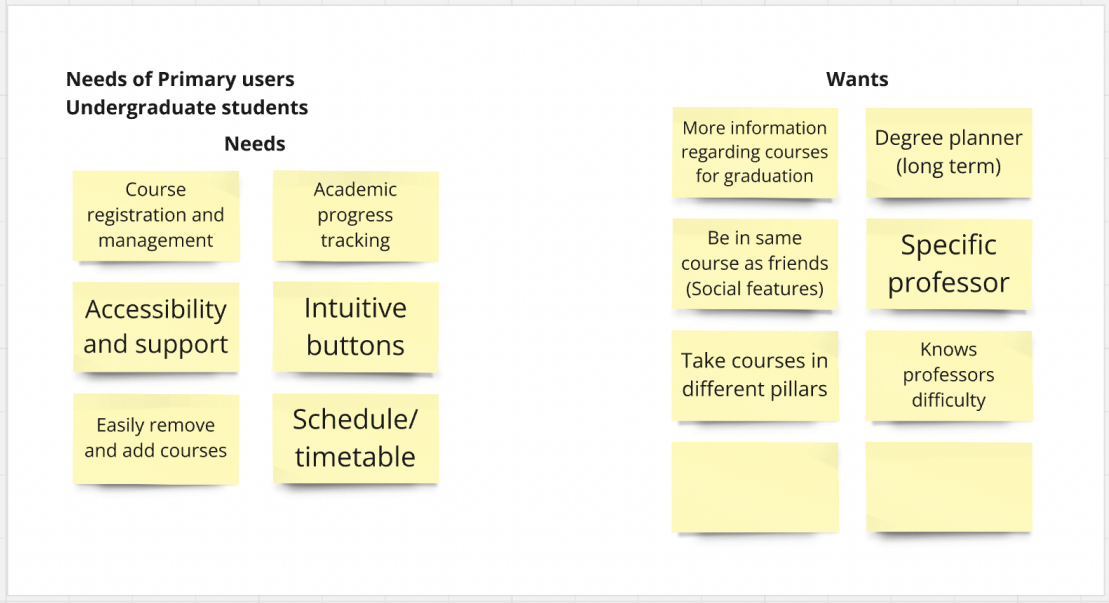


Figure 2: Needs and wants of Primary Users, similar boards were created for secondary and supplemental user

3.2 Rationale for User Selection

SUTD students are the primary users as the interface is designed primarily for them to select classes for the upcoming term. Exchange students are secondary users due to SUTD's partnership with other universities, which brings them into the course selection process. Parents and friends are supplemental users, supporting SUTD students in their selection and potentially influencing their choices. University staff and faculty may engage with the interface for various reasons, contributing to a holistic user experience.

3.3 Creating User Personas

Each persona highlights distinct goals and pain points, offering valuable insights to identify and address potential issues within the course registration process. By applying these insights to the working prototypes, the team can refine the system's usability and relevance to user needs. Each persona represents a unique scenario, underscoring the varying requirements across different user profiles. The user journey further reveals insights into user experiences, capturing their emotions, challenges, and expectations throughout the registration process. This perspective facilitates a user-centred approach to enhancing the system's design and functionality.

3.3.1 Primary Users

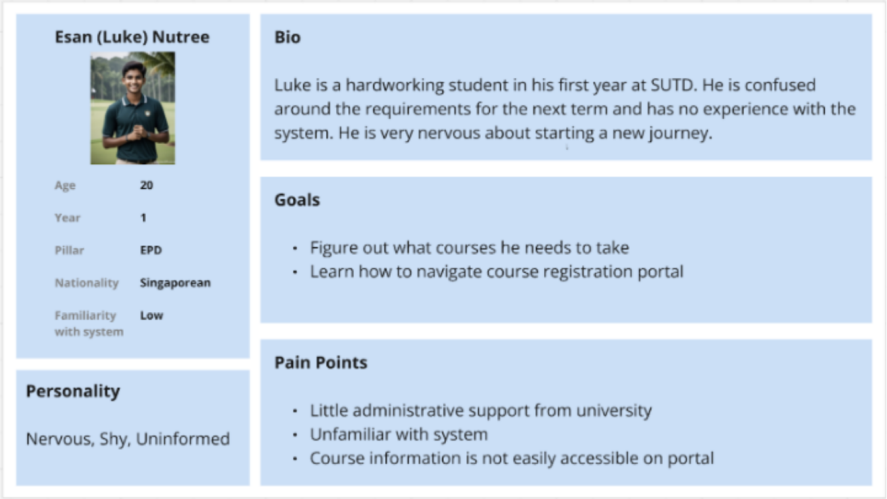


Figure 3: Persona of Esan, a Freshmore SUTD student

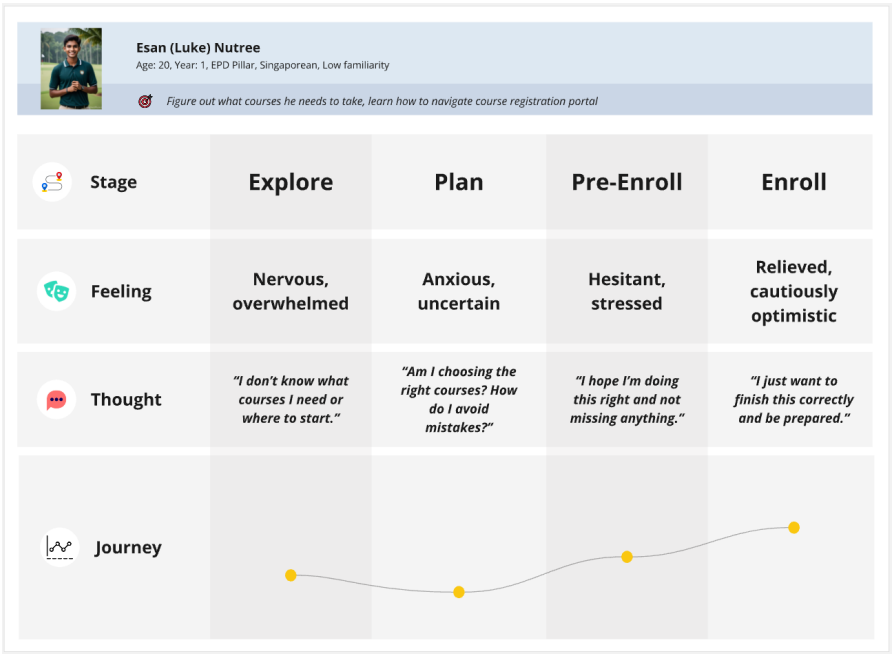


Figure 4: User Journey of Esan

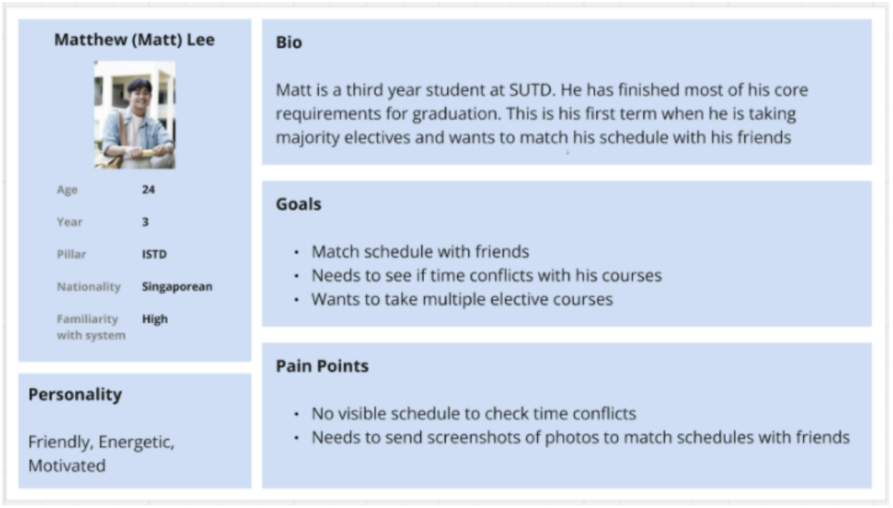


Figure 5: Persona of Matthew, a Senior SUTD student

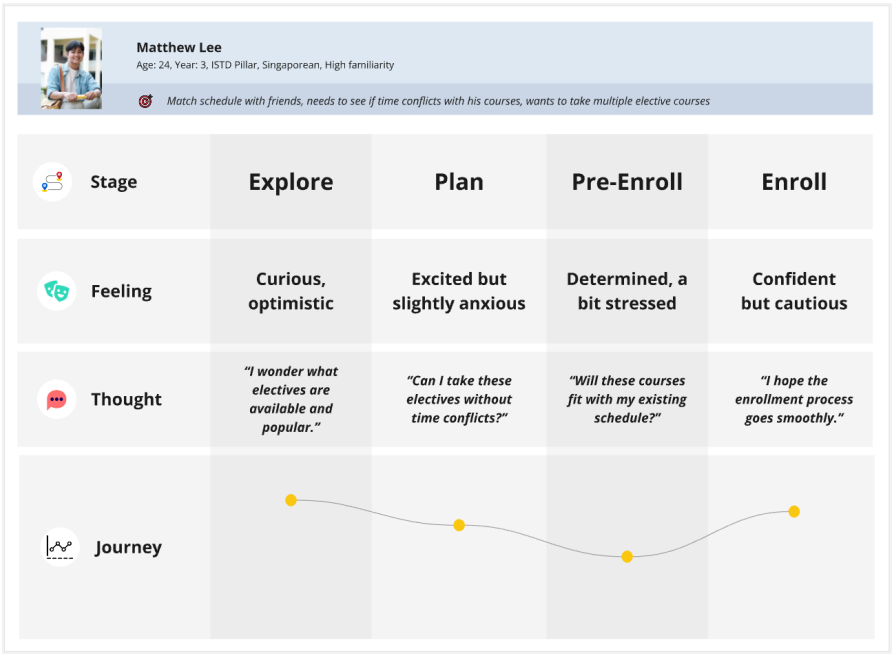


Figure 6: User Journey of Matthew

3.3.2 Secondary User

Figure 7: Persona of Danny, an exchange student from Chicago

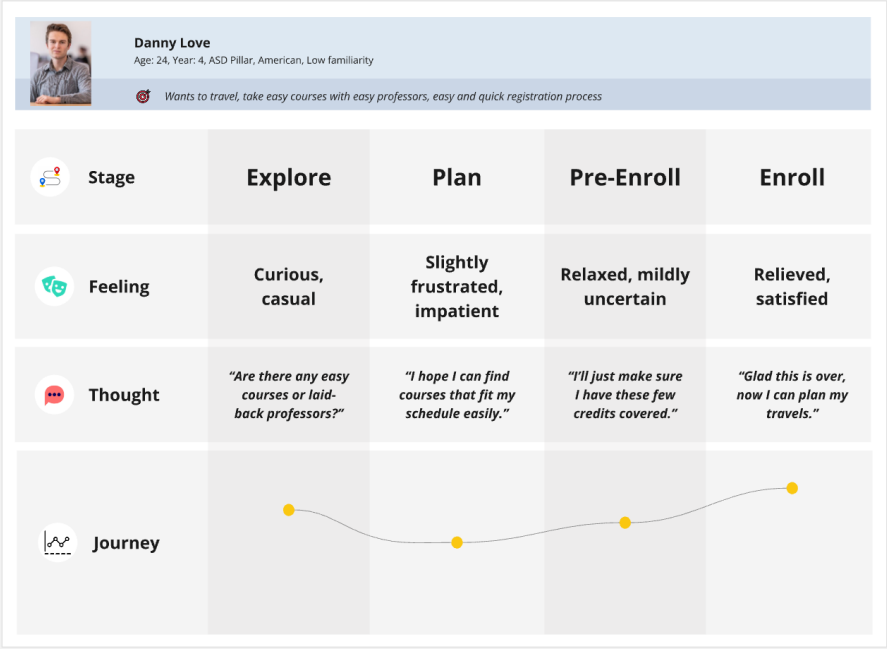


Figure 8: User Journey of Danny

4 Scenarios

4.1 Scenario 1 (Esan Nutree)

Esan, a Freshmore student at SUTD, is preparing for his first course registration exercise. Feeling overwhelmed and unsure of where to start, he logs into the newly updated course registration webpage, hoping to make sense of the unfamiliar process.

Getting Started: Everything Feels New
As Esan lands on the homepage, the interface is unfamiliar, but still finds many elements that he recognises. He takes a moment to explore, exploring different sections and tabs. He finds the search bar, prompting him to search for a course. He searches for a class he wants to take. After a quick moment, the search results display a number of courses that fit the criteria he had put in, with information that he finds useful to his track specialisation. Esan feels reassured seeing which courses match his academic track, even though he does not yet fully understand the academic system.

Curiosity Drives Exploration
Unsure of what to select, Esan clicks on one of the courses in the search results to learn more. The detailed course description gives him a clearer idea of what the course involves. The ratings system below the description gives him a concise presentation of what other students felt about the course, which he takes into account when evaluating his enrolment in the course.

Using Filters to Narrow Down Results
Esan starts to feel overwhelmed by the long list of results, so he tries the filter options to refine his search further. By specifying the pillar he is interested in pursuing and the upcoming term, he narrows the search results to courses that are specifically relevant to his pillar and degree. This step makes him feel slightly more confident as he begins to see courses that align with his goals.

Building a List of Intended Enrolment
Esan shortlists a few courses and adds them a list, which allows him to keep track of his selections before enrolling. He notices a schedule view updating automatically, showing how his chosen courses fit into his weekly timetable.

As he selects courses, conflicts in the timetable appear to show potential overlaps. Esan spots a conflict between two of his shortlisted courses and removes one, using the schedule view to guide his decision before moving forward with enrolment.

Learning Through Exploration
Esan spends time clicking through multiple courses he is interested in, reading their descriptions, and experimenting with the filters. He gradually learns how to navigate the system and refine his selections. By the time he logs out, Esan has built a shortlist of courses he intends to enrol in and feels more familiar with the process. Although he still has questions, he feels less intimidated and more prepared for enrolment.

Outcome
For Esan, this course registration experience is a journey of exploration. Features like an intuitive search bar, filters, track alignment indicators, live schedule view, and time conflict indicators guide him through what initially felt like an overwhelming process. By the end of the session, Esan feels a growing sense of confidence and is ready to finalise his enrolment.

4.2 Scenario 2 (Matthew Lee)

Matthew, a third-year ISTD student at SUTD, is excited about selecting electives for the upcoming term. After dealing with the frustrations of the old course registration system, where manually cross-checking schedules and coordinating with friends was tedious, he is optimistic about using the newly updated course registration webpage.

Getting Started: Leveraging Familiar Course Codes
Matthew logs into the system with a clear idea of the courses he wants to take, informed by recommendations from peers and prior research. Using the search feature, he searches for specific courses by their course codes and titles. The search results display important information regarding the course, but most importantly whether the course aligns with his track (specialisation). This simplicity helps him quickly identify relevant courses and focus on his selections.

Exploring Course Details and Checking Friend Enrolment
Matthew clicks into one of the courses to confirm it fits his plans. The course details page provides a concise description and a ratings section with feedback from other students.

As he reviews the course, he notices that there are two available sections of the class for enrolment (Class 1 and Class 2). Next to the class information, Matthew sees which of his friends are enrolled in each class. Spotting that two of his close friends have already enrolled in Class 1, he decides to join the same class to match their schedule. He adds the course and Class 1 to his list of courses he intends to enrol in, excited to be able to take classes with his friends.

Finalising Selections with the Deconflict Feature
Matthew continues adding courses to his list while monitoring his weekly timetable through the live schedule view. There are indicators that indicate a time conflict between his selected courses, allowing him to visually check for potential timetable clashes. Confident that his selections are conflict-free, Matthew proceeds to enrol all his pre-selected courses when the enrolment window opens.

Resolving a Post-Enrolment Conflict
After enrolling in all his courses, Matthew reviews his finalised schedule and notices that the schedule indicates a time conflict he had overlooked. Realising that two of his enrolled classes overlap, he clicks on schedule to access a detailed view of the conflicting timetable entries.

In the detailed view, Matthew selects one of the conflicting classes and deregisters from it directly from the schedule page. After deregistering, he revisits the course details page and enrols in the alternative class for the same course, which resolves the conflict. The conflict disappears, and his updated timetable reflects the corrected schedule, ensuring all his courses

are now properly aligned.

Outcome
The updated course registration webpage transforms Matthew's experience, making the enrolment process efficient and intuitive. Features such as the search bar, track alignment indicators, course details with friend enrolment visibility, and live schedule visualisation smoothens pre-enrolment process. When a post-enrolment conflict arises, the system highlights the class block that are conflicting and provides means to resolve conflicts. For the first time, Matthew completes his enrolment with confidence, knowing his academic and social priorities are perfectly aligned.

4.3 Scenario 3 (Danny Love)

Danny, a fourth-year exchange student from Chicago, has just arrived at SUTD. With his primary focus on travelling and participating in an International Undergraduate Research Opportunities Program (IUROP) project, he aims to enrol in two courses that are easy to manage and give him a deeper cultural perspective of Singaporean students and their academic environment. Familiar with the cumbersome registration process at his home university, Danny is curious but sceptical about what SUTD's course registration webpage has to offer.

Exploring: A Fresh Perspective
Danny logs into the system and is surprised by how clean and intuitive the interface feels. At his home university, course registration is a tedious process involving long lists of irrelevant courses and a lack of focus on user experience. The search feature on this webpage allows him to search broadly for courses focusing on "culture" and "design," topics that interest him as a foreign student.

The search results display the courses relevant to his search query, making it easy for Danny to browse through the options. The concise presentation of results helps him quickly shortlist a few courses that seem to offer a unique cultural perspective.

Diving into Course Details
Curious to learn more, Danny clicks on one of the courses. The course description is concise yet informative, giving him an immediate understanding of the module's focus. He notices that the course explores cultural design approaches, incorporating examples from Singapore and Southeast Asia—just what he's looking for to broaden his perspective.

Danny appreciates the rating system in this course enrolment interface, where students have provided feedback on the workload and teaching style. Comments from previous exchange students highlight how the professor encourages open discussions about cultural differences, which further solidifies his interest in the course.

Planning with Intended Courses and Schedule View
Danny adds a few shortlisted courses to his list. The system shows him a schedule with live updates, showing how the selected courses fits into his timetable. At his home university, planning a schedule often requires juggling spreadsheets and external tools, but this seamless integration allows Danny to see his weekly layout instantly.

He is also amazed by the deconflict features provided by the system, which highlights selected courses that have time conflicts. By visually mapping out his selections, Danny can easily avoid overlaps and ensure that his schedule leaves ample time for his travels and project commitments.

Effortless Completion
When Danny finalises his choices, the enrolment process takes only a few clicks. The system provides a confirmation of his enrolment and displays his completed timetable. The speed and simplicity of the process leave Danny both relieved and impressed.

Outcome
The updated course registration webpage allows Danny to easily find and select courses that align with his interest in culture, such as modules that explore Southeast Asian design and cross-cultural perspectives. The system's intuitive features, such as the adapting search function, live schedule view, and list of intended courses, simplify the enrolment process and ensure that he can finalise his timetable with minimal stress.

More than just selecting courses, Danny is inspired by the streamlined and thoughtful design of the enrolment process. Compared to the inefficient system at his home university, this webpage integrates all the tools he needs in one place, making the experience not only faster but also more enjoyable. Motivated by this experience, Danny decides to advocate for similar features—such as real-time scheduling, integrated course details, and user-friendly navigation—at his home university, believing they could benefit many students like him.

5 Observations

To identify common issues SUTD students face with the course enrolment process and to evaluate the effectiveness of proposed solutions, the team employed surveys as the primary method of gathering user feedback. These surveys aimed to gauge user satisfaction and measure the ease with which students can complete tasks related to course selection and enrolment. Additionally, the team will observe user interactions through both low-fidelity and high-fidelity prototypes, tracking metrics such as error rates, task completion time, and overall efficiency. These observations will provide real-time insights into user interactions with the interface, supporting a data-driven approach to design refinement.

Below, the team presents findings on general sentiments among SUTD students about their experience with the course enrolment process. The data gathered has guided the team in understanding students' frustrations and curating a meaningful solution.

The following charts summarise survey data gathered from SUTD students, helping the team to better understand students' frustrations and identify areas for improvement in the course enrolment process.

5.1 Key Pain Points in Course Enrolment

To gain insights into the challenges faced by students, the team surveyed senior students who have extensive experience using the platform for various academic tasks. The options were chosen from features of SUTD's student portal, MyPortal. The results revealed that course enrolment stands out as the most frustrating task, with 57.9% of respondents identifying it as their primary pain point (refer to Figure 9). This significant majority underscores the importance of addressing usability issues within the course selection process.

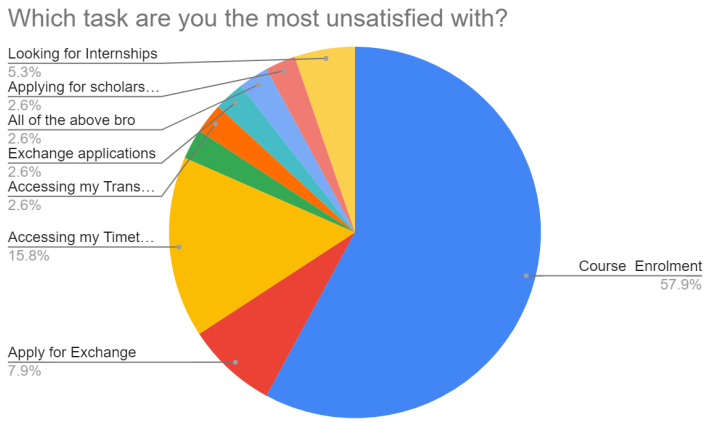


Figure 9: 57.9% of 38 senior respondents are dissatisfied with course enrolment

Additional pain points included challenges with accessing timetables and applying for exchanges, though these were comparatively less significant. These insights support prioritising improvements to course enrolment, as it directly impacts students' academic planning and overall satisfaction.

In the survey, many students cited difficulties locating specific courses, largely due to the reliance on exact course codes and pillar information during searches. Additionally, respondents highlighted that the inconsistent layout and unintuitive filtering options contribute to a confusing experience for users (refer to Figure 10). These findings suggest a need for an optimised, user-centred design that emphasises straightforward navigation, intuitive search functionality, and a more organised interface layout. Enhancing these elements could make course enrolment significantly more accessible and reduce the frustration students currently experience.

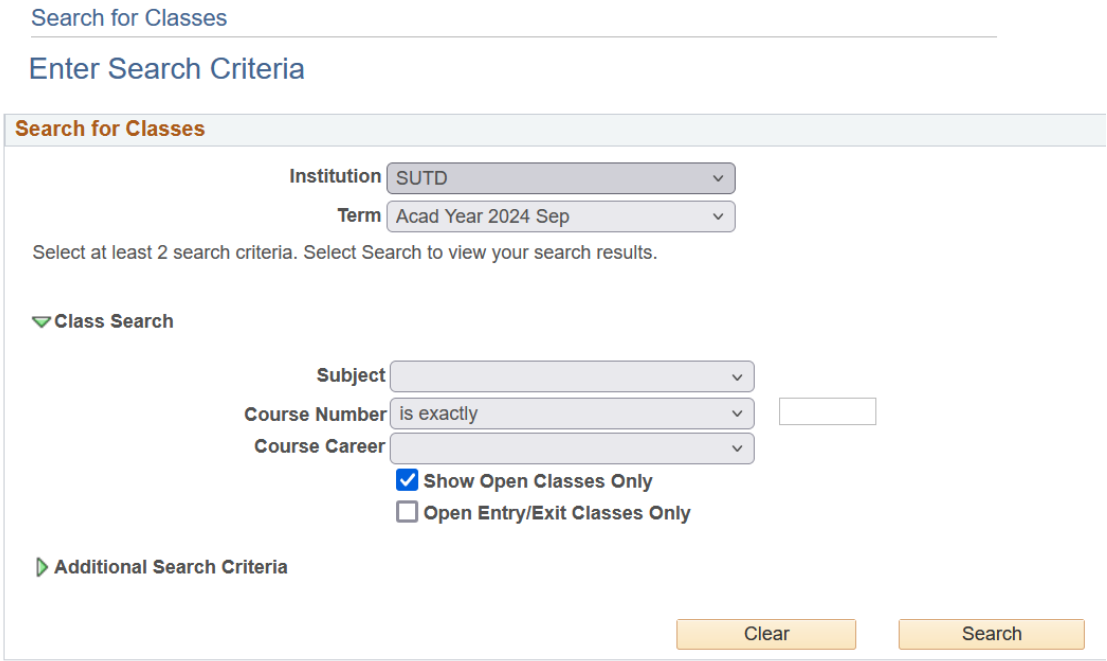


Figure 10: Course Enrolment Search Page (Singapore University of Technology and Design, 2024)

5.2 Ease of Use in Course Enrolment

Student feedback on ease of use indicates notable challenges in navigating the course enrolment interface. When students were asked to rate their first experience with the course enrolment process on a scale from 1 (very difficult) to 5 (very easy), the average ease-of-use rating was 1.8. This low rating suggests that the current layout and functionality may not sufficiently support intuitive navigation, especially for first-time users, and highlights the need for a more accessible and user-friendly interface design to facilitate enrolment for users unfamiliar with the system (refer to Figure 11).

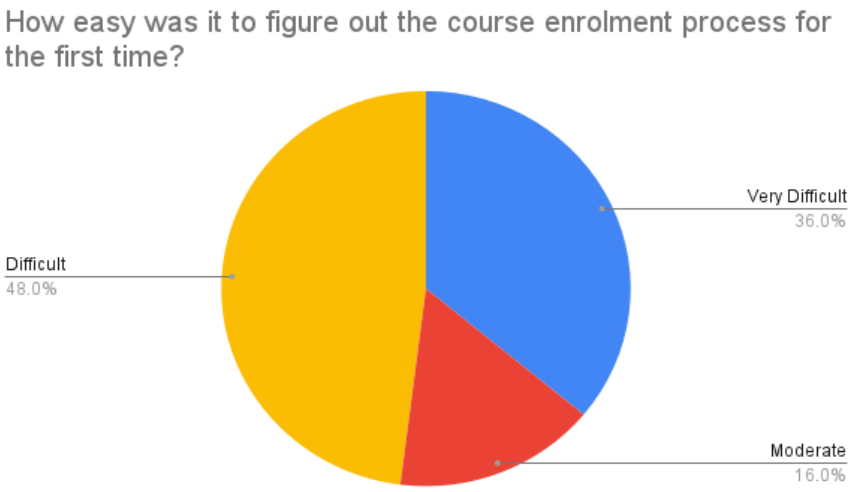


Figure 11: Survey on initial ease of Course Enrolment (33 Students)

5.3 User Satisfaction with Course Enrolment

Students were also asked to rate their overall satisfaction with the course enrolment features, using a scale from 1 (very unsatisfied) to 5 (very satisfied). The course enrolment process received an average satisfaction rating of 2.08, demonstrating a sense of dissatisfaction among over half of the students surveyed. When asked to specify the source of this dissatisfaction, respondents specifically mentioned difficulty in quickly locating course details and available enrolment options, indicating that enhancements in clarity, information accessibility, and task flow could significantly improve user satisfaction (refer to Figure 12).

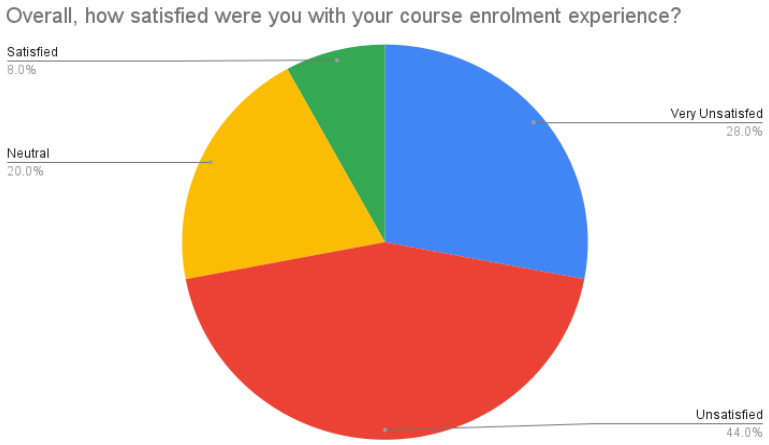


Figure 12: Survey on student satisfaction with course enrolment (33 Students)

5.4 Error Frequency in Course Enrolment

Survey data on the frequency of issues encountered specifically during course enrolment reveals additional areas for improvement. Only 4.0% of students reported that they rarely experienced issues with the course enrolment process, while the remaining majority indicated that they often encountered errors. On a scale from 1 (Almost Never) to 5 (Very Frequently), the average error frequency was 3.48. This moderately high error rate underscores the importance of optimising the enrolment system to ensure smoother, more reliable experiences for students (refer to Figure 13).

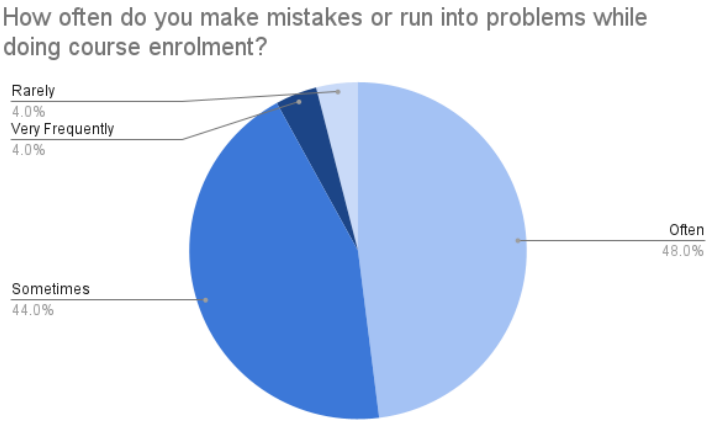


Figure 13: Out of 33 students who participated, only 4.0% rarely encounter problems during course enrolment

6 Prototyping

6.1 Prototyping Process

The team utilised Figma to create a wireframe of a web application which will act as a low-fidelity prototype of the solution. The purpose of the low-fidelity prototype is to better understand a user's preference when registering for courses. It allows the team to focus on the user's navigation and task flow as well as the functionality of the proposed solution. This insight will assist the team, followed by iterations of the low-fidelity prototype to ensure it aligns with the user's mental model before proceeding.

After conducting user testing with the low-fidelity prototype, the next step will involve developing a high-fidelity prototype. This version will emphasise visual aesthetics, usability, responsiveness, and interaction quality. The high-fidelity prototype will allow users to interact deeply with the proposed solution, enabling the team to gather crucial insights into user behaviour and preferences. By focusing on users' overall satisfaction and experience with the interface, the team can gain a better understanding of how well the solution addresses key pain points, such as course selection challenges. This refined prototype will help the team assess the effectiveness of the search functionality in reducing students' frustration and anxiety, offering detailed and relevant information to support informed decision-making during course enrolment.

6.2 System Design

The three main functionalities of our solution will include: course searching, display of course information and course enrolment using a shopping cart feature (refer to Figure 14).

Users will be able to use keywords in their queries such as course title, course code, term, pillar and professor in order to search for courses. The search page will then display relevant courses based on the search queries. Relevant information will be displayed such as course description, rating, timetable and student review. With the relevant courses shown on the screen, users can add those courses to a shopping cart and consult a visual timetable based on what was added. In addition, the system will allow users to remove courses from the cart to avoid time conflicts. After filling their cart, users will be given the shortcut to enrol in all their selected courses in one button.

Figure 14: Design of the course enrolment website

7 Prototype (Low-Fidelity)

The low-fidelity prototype is separated into three sections: course searching, display of course information, and course enrolment shopping cart.

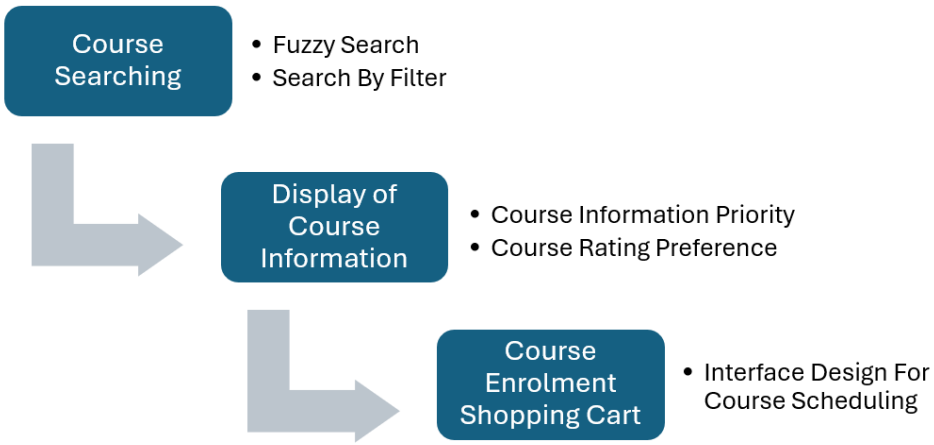


Figure 15: Low-Fidelity Prototyping Process, the bullet points represent the low-fidelity tests to be performed

7.1 Course Searching

The process of designing the low-fidelity prototype first began with an analysis of existing solutions. These solutions included the course registration website on SUTD's MyPortal and Hong Kong University of Science and Technology's (HKUST) Class Schedule & Quota Page. Referring to Figure 10, the system used at SUTD currently allows users to search by terms, subject, course number, open class, or closed class. Our initial surveys revealed a need to improve on such features due to the number of options and unclear instructions.

A further investigation was performed on HKUST's Class Schedule & Quota Page. Referring to Figure 16, the page consists of a course search bar that allows users to search based on school terms and keywords such as course numbers, titles, and instructors. In addition, it also consists of a pillar filter at the bottom of the search bar. This system's functionalities were focused on a user's major and catered search results to their academic goals.

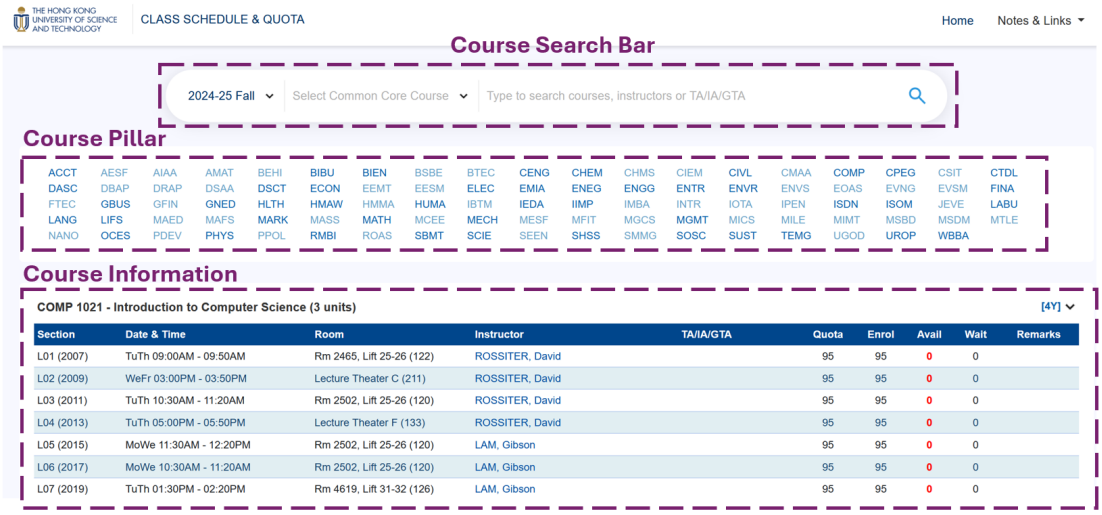


Figure 16: Screenshot of the Class Schedule & Quota page from HKUST (The Hong Kong University of Science and Technology, 2024)

Based on insights from both MyPortal's limitations and HKUST's efficient design, the team first designed a low-fidelity prototype that includes two variations of the search functionality:

- **Fuzzy Search:** This design enables users to type any course-related keywords (course code, course name, professor name, term) and receive real-time suggestions, even if there are minor typos or partial matches (refer to Figure 17). This approach aims to support flexible searching without requiring exact terms, making the interface more forgiving and user-friendly.
- **Filter Search:** This design includes multiple dropdown filters for course attributes such as pillar, professor and term, allowing users to refine results precisely (refer to Figure 18). The ability to apply multiple filters helps users narrow their search criteria and find courses that meet specific requirements.

The different designs allow the team to gauge which iteration of the search functionalities students prefer. It provides an improved, intuitive searching experience tailored to student needs, aiming to streamline the process of finding relevant courses and enhancing overall satisfaction with the course enrolment interface.

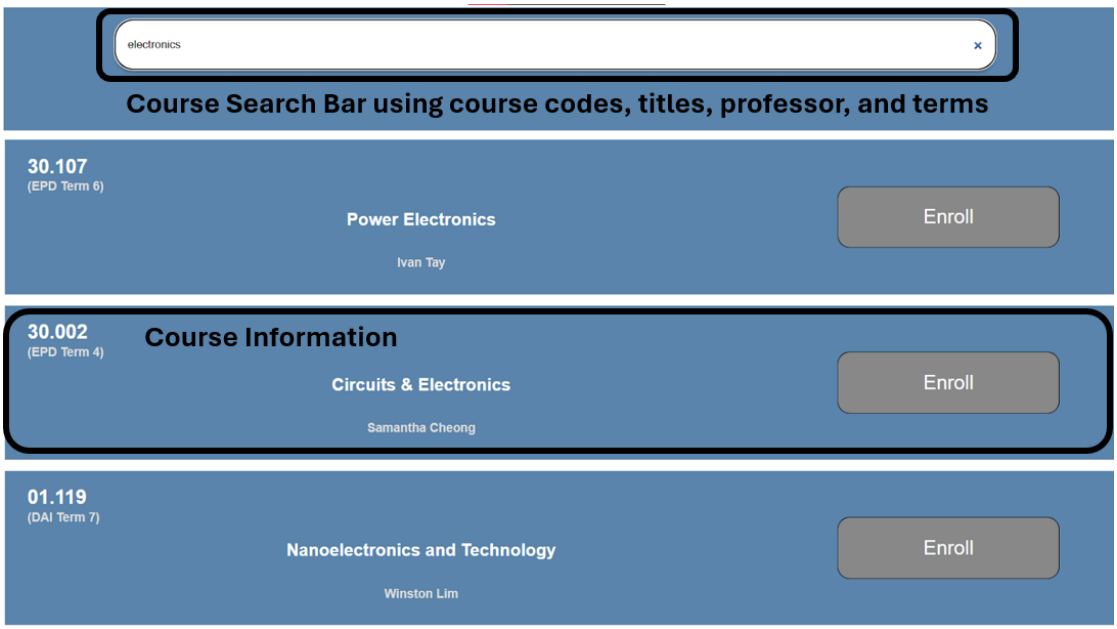


Figure 17: Fuzzy Search Low-Fidelity Prototype

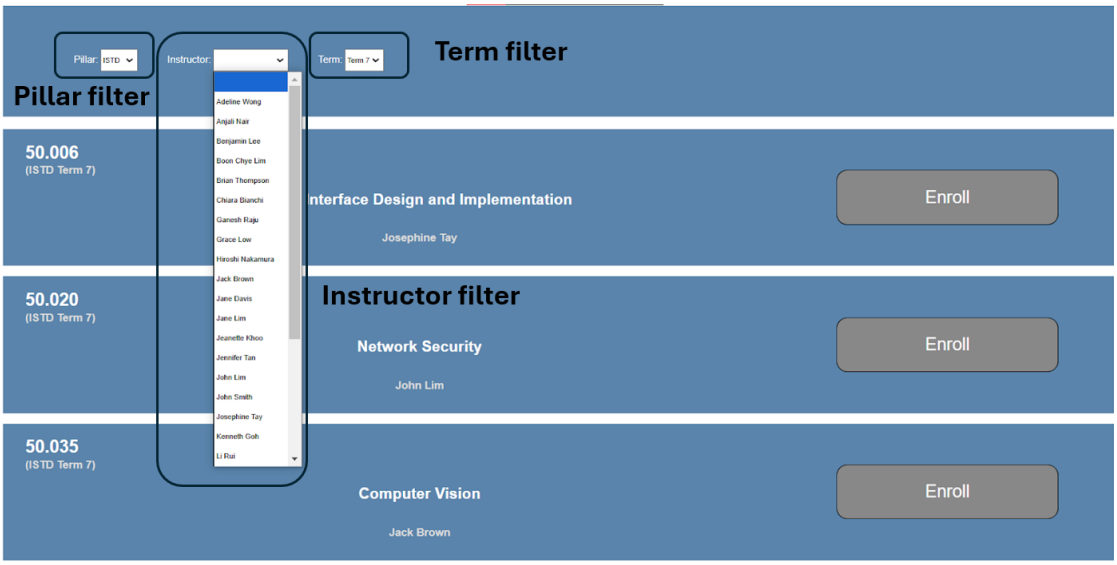


Figure 18: Filtering Search Low-Fidelity Prototype

7.2 Display of Course Information

The second low-fidelity prototype focuses on displaying relevant and useful information to users. This section will allow the team to better understand the motivation behind users' decision-making in the course enrolment process.

Besides including essential schedule information, additional information can also be provided to aid in the decision-making of users, such as course descriptions, course ratings from

students, and student reviews. Since there is a significant amount of information to be displayed, testing the order in which users select sub-categories of course information will determine users' priority of information.

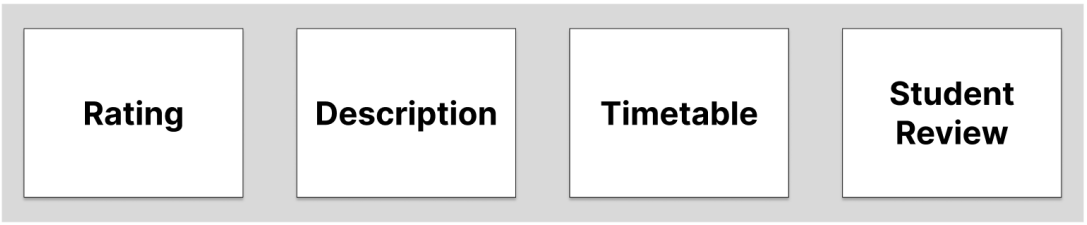


Figure 19: Course Information Priority Low-Fidelity Prototype

Users were given four tabs (refer to Figure 19), each designed to display different categories of information in order to allow users to learn about a new course. More information about this test will be discussed in the User Testing section.

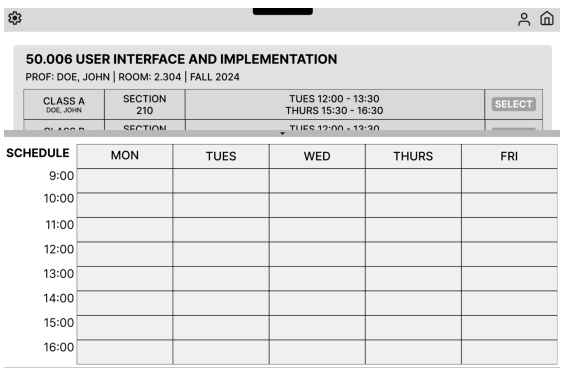
7.3 Interface Design for Course Scheduling & Visualization of Timetable

The final low-fidelity prototype centres on course scheduling and timetable visualisation. Survey feedback indicated that a concurrent timetable view helps students address time conflicts effectively. The team developed two variations of the course registration page, showing two courses, 50.006 User Interface and Implementation and 10.002 Physics I, each offering two classes with specific schedules.

In this design, students can select classes by clicking the "SELECT" button, adding the chosen class to their timetable view. If a time conflict arises between the selected classes, students can resolve it by clicking the "REMOVE" button to deselect conflicting options, making it easier to manage their schedules.

7.3.1 Variation 1

The first variation of this design features a collapsible schedule window (refer to Figure 20) positioned in front of the course list, allowing users to view and manage their schedule directly on the same page. If a scheduling conflict occurs, a pop-up notification alerts the user immediately.



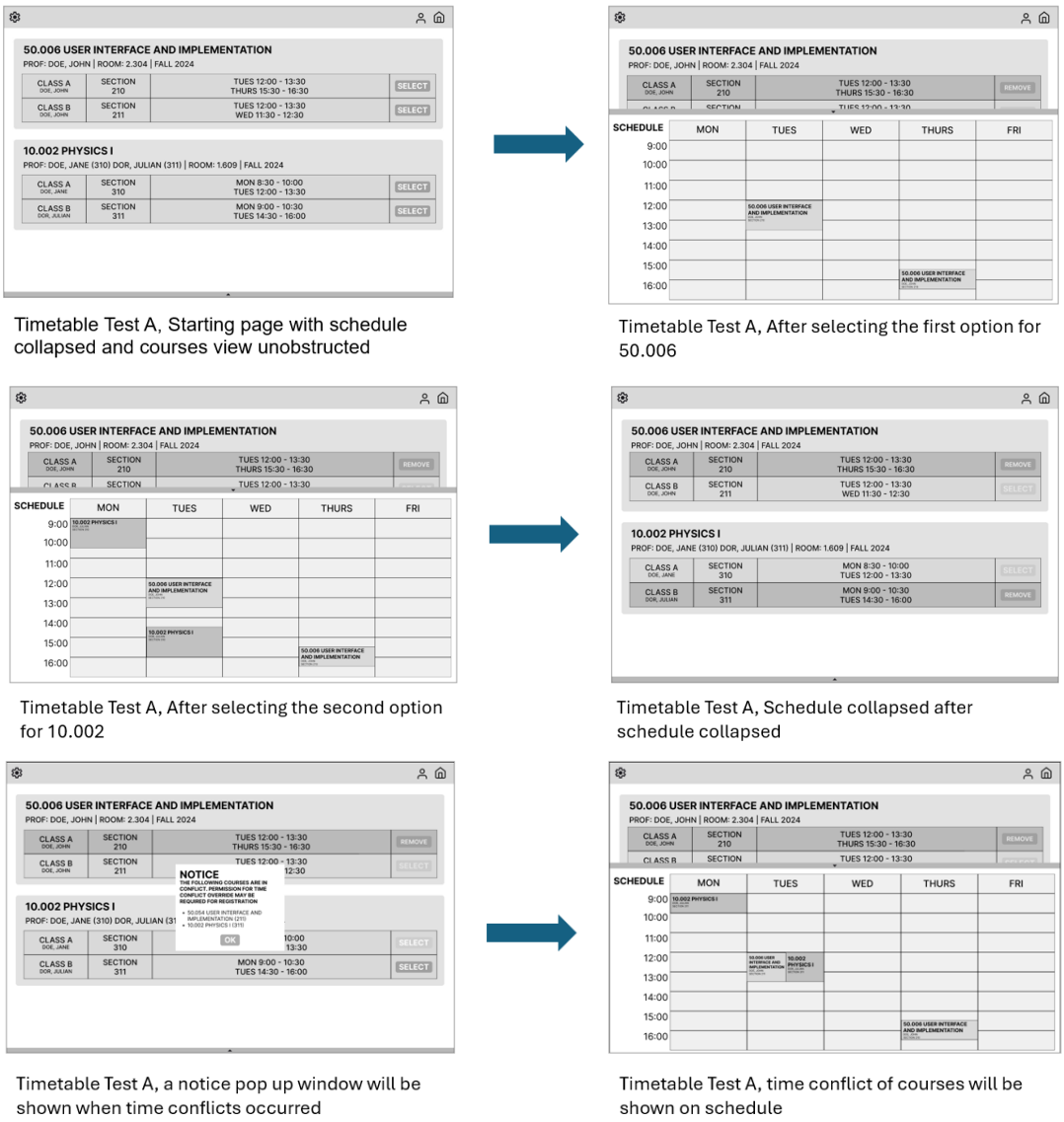


Figure 20: Collapsible schedule for course enrolment

7.3.2 Variation 2

The second variation mirrors the first but displays the course schedule in a separate tab rather than in the collapsible window on the main page (see Figure 21). This tab-based approach provides a cleaner separation between course selection and timetable viewing.

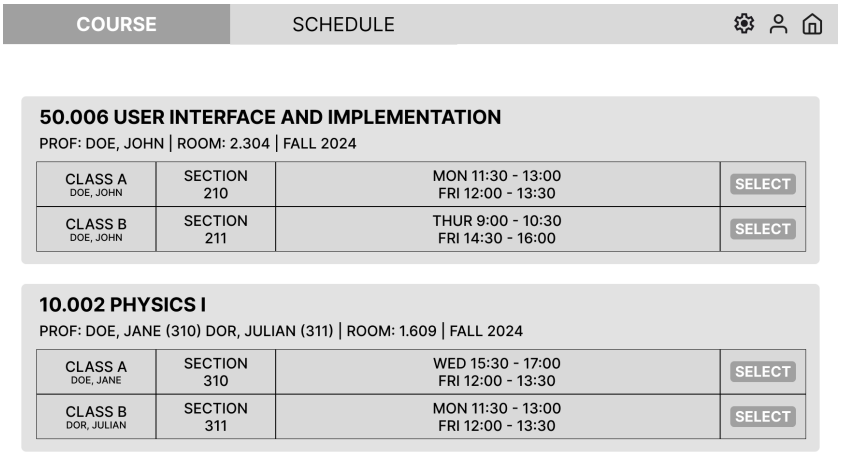


Figure 21: Course Tab of Variation 2

Figure 22: Schedule Tab of Design 2

8 User Testing (Low-Fidelity)

To ensure the proposed solution effectively addresses the gaps identified within MyPortal's course enrolment portal, namely in difficulty in finding courses and unintuitive interface design, the team plans to conduct comprehensive user testing with students from various cohorts. The evaluation will focus on four key categories: efficiency and intuitiveness of search functionality, interface efficiency, relevance of course information in the user's decision-making process, and user satisfaction. Each of these categories will be assessed using both qualitative and quantitative data gathered from user interactions with the prototypes.

8.1 Low-Fidelity Test

The team approached 10 SUTD seniors to test the prototype. Each participant was interviewed and evaluated with the following tests, namely:

- Course Searching Mechanism
- Course Information Priority
- Course Rating Preference
- Interface Design For Course Scheduling Window

8.1.1 Course Searching Mechanism

Two search mechanisms were proposed, a fuzzy search bar and a filtering system. The fuzzy search (refer to Figure 17) contains a search bar that allows one to search for keywords related to the course. This includes the course information, professors, course names, course code, and pillar that offers it.

The filtering system (refer to Figure 18) contains three main filter categories, namely course pillar, instructor, and term. Students can utilise these three filters to find their course.

7 pre-defined scenarios from all pillars, ISTD, ASD, ESD, EPD, DAI, HASS and Freshmore were curated for this test (see Appendix A) to minimise participant's familiarity with their own field. In addition, different combinations of course information such as course title, pillar, professor and description are provided in the pre-defined scenarios, to simulate what students would experience during their course selection process.

For example, the "DAI scenario" is designed where only the description, pillar and term are provided, so that users cannot find the required course easily using the course title or code:

> **"You've been keen on exploring how AI can impact design ever since you heard about it in a guest lecture. Curious, you want to find out if DAI or ISTD offers any course with similar learning outcomes in Term 8."**

To minimise participant bias from existing knowledge, fictitious modules were used in the test, alongside real modules within the search database.

The team defines the following hypotheses for this test:

- **Null Hypothesis, H_0:**
  There is no significant difference in searching speed between the filtering and fuzzy search method for course searching.
- **Alternative Hypothesis, H_1:**
  The fuzzy search method performs significantly faster than the filtering method in course searching.

The test was performed with half the participants starting with the fuzzy search method and the other half starting with the filtering method as a counterbalance. To reduce learnability and fatigue from participants, other tests were conducted in-between methods.

8.1.1.1 Methodology

During the user testing, participants were presented with the pre-defined scenarios (see Appendix A) sequentially in a random order and the time they took to enrol for each of these scenarios was recorded. The order of information they input in the fuzzy search bar or filtering system was also documented to understand the flow that participants took when searching. Finally, the accuracy of the user in selecting the correct course was also recorded.

To eliminate bias and remove outliers, data was filtered using two criteria. First, all trials that resulted in a wrong answer were removed. For instance, if Person 3 enrolled in an incorrect course during the DAI scenario while using either filter or fuzzy search, both search times were excluded from the analysis. This step was necessary, as prioritising speed over accuracy in course enrolment is an invalid use case for the system. Next, within each scenario, potential outliers were flagged if they were more than ± 2.5 standard deviations $\hat{\sigma}$ from the mean. For each of the five identified outliers, trial remarks were reviewed to detect any anomalous behaviour. In one notable case, Person 1 remarked they would "try something new", leading to the largest deviation in the dataset ($+2.81\hat{\sigma}$), and this was determined to be an outlier.

A paired t-test was conducted for each scenario to compare the time differences between filter and fuzzy searching. For each individual *i*, the difference in search time d_i was calculated. The arithmetic mean of the time differences $\bar{d}$ and the sample standard deviation $\hat{\sigma}_d$ were then computed. Finally, the t-test statistic t was calculated and compared to a t-distribution with $n - 1$ degrees of freedom to obtain the right-tail p-value $Pr(T \geq t)$.

Formulas used:

$$d_i = t_{\text{filter},i} - t_{\text{fuzzy},i} \qquad \bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$$

$$\hat{\sigma}_d = \sqrt{\frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1}} \qquad t = \frac{d}{\hat{\sigma}_d/\sqrt{n}}$$

8.1.1.2 Results

Scenario	Sample Size (n)	$\bar{d}$	$\hat{\sigma}_d$	p-value	Significant? ($p \leq 0.05$)
1 (ISTD)	9	6.6201	6.3065	0.0068	TRUE
2 (ASD)	10	1.5403	2.5139	0.0423	TRUE
3 (ESD)	10	3.1575	5.2613	0.0451	TRUE
4 (EPD)	9	2.4518	2.2791	0.0007	TRUE
5 (DAI)	4	-4.9893	4.6006	0.9407	FALSE
6 (HASS)	10	5.0897	5.4834	0.0083	TRUE
7 (Freshmore)	10	6.5872	5.2964	0.0017	TRUE

Table 1: Results for paired t-test

Observations indicated that fuzzy search and filtering search performed well in different contexts. Filtering search was preferred when users had only abstract information about a course; data showed that *Term* was the most frequently applied initial filter. In contrast, users often relied on fuzzy search when they had specific information about the course, particularly the *Course Title*, which served as a unique identifier for courses. When the *Course Title* was unavailable, users typically searched by *Professor*, suggesting that in their mental model, the professor's name would be the next most effective way to narrow down results.

Referring to Table 1, we reject H_0 ($p \leq 0.05$) in all scenarios except the DAI scenario. This was mainly due to the lack of course title and professor information provided in the scenario description causing participants to key in unsupported search terms such as "DAI Term 8". While it can be argued that the fuzzy search should support chained search criteria among other search patterns, it remains clear that fuzzy search alone does have limitations that filtering can easily solve. This suggests that filtering search was more efficient with limited course details, while fuzzy search was preferable for precise, keyword-based searches.

Based on user feedback and data, the team concluded that incorporating filtering into fuzzy search would combine the strengths of both methods, resulting in a more versatile and efficient solution that aligned well with users' search behaviours and mental models.

8.1.2 Course Information Priority

In this test, participants would be given the context of understanding a new course and whether they would be interested in enrolling into the course. They would be tasked with selecting the relevant tabs to find out more about a course. For each of the four possible tabs (refer to Figure 19), the participants would be shown minimal information about the module. The purpose of this test was to understand what options users were most drawn to and in what order they prioritised the course information. This would allow us to prioritise the display of course information for future designs.

8.1.2.1 Results

Weights were given to each information category based on the order of which the participants selected them:

- **4:** 1st Selected
- **3:** 2nd Selected
- **2:** 3rd Selected
- **1:** 4th Selected

The following was the result based on the weighted categories.

Category	Score
Description	31
Rating	29
Timetable	23
Student Review	17

Table 2: Scores of information category

"Description" scored the highest at 31 (refer to Table 2), representing the most important information and "Student Review" scored the lowest (refer to Table 2) and hence is the least important information to participants amongst the four categories presented.

These findings demonstrate that users consider a detailed and accessible course description to be the most essential element when choosing a course. The course description likely provides them with an initial sense of the course's content, objectives, and relevance to their academic goals, making it a critical point of reference. Meanwhile, course ratings and timetable information, while still valued, were secondary priorities.

In response to these insights, the team has decided to prioritise the inclusion and visibility of course descriptions in the application's design. This will be accomplished by making the course description prominent and easy to access, ensuring it immediately catches the user's attention. The layout will incorporate ratings and timetables in a manner that respects their relative importance, making sure they complement rather than overshadow the description.

8.1.3 Course Rating Preference

This test focused on understanding what aspects of course ratings were most valuable and easy to interpret for users. This involved analysing which rating labels students found intuitive and which categories of information were essential for making informed decisions about courses. Drawing inspiration from the popular RateMyProfessor platform (Rate My Professors, 2024) used by students in the United States and USTSPACE platform (USTSPACE, 2024) used by HKUST students, the research team sought to assess whether students could readily understand the factors influencing course ratings. Additionally, the team aimed to identify which specific types of information students prioritised most when evaluating a course.

From general consensus of students, we have come out with 8 subcategories for rating labels. Participants would be given a list of possible rating labels for courses. These include:

- Content
- Satisfaction
- Workload
- Difficulty
- Teaching
- Grading
- Would Recommend (% of students)
- Job Oriented

The meaning of the above labels can be found in Appendix B.

Participants would be asked about their interpretation of each label's meaning to highlight ambiguous rating labels and to align the interpretation of the participant. After which, the participants would rank the top four rating labels that they find the most helpful in aiding their decision to enrol in a course. This approach allows the team to determine which aspects were most impactful for students when reviewing ratings.

8.1.3.1 Results

A scale where 1 represents important but not irrelevant information, 4 represents the most important information to a participant was given, and 0 represents those that were not ranked.

For each label, the score is calculated using the following formulas.

$$\begin{aligned}\text{Total} = {} & 4 \times (\text{count of rank } 1) + 3 \times (\text{count of rank } 2) \\ & + 2 \times (\text{count of rank } 3) + 1 \times (\text{count of rank } 4) \\ & + 0 \times (\text{count of no rank})\end{aligned}$$

$$\text{Score} = \frac{\text{Total}}{\text{number of counts}}$$

Label	Score
Content	**2.5**
Teaching	**1.6**
Workload	**1.5**
Difficulty	**1.4**
Satisfaction	1.0
Grading	0.8
Job Oriented	0.8
Would Recommend	0.6

Table 3: Scores of course rank labels

The above reveals that participants (refer to Table 3) consistently ranked content, teaching quality, workload, and difficulty as the most critical factors, in that order. These four categories were chosen from an initial set of eight possible rating dimensions, underscoring that students focused on aspects directly related to the learning experience and academic demands of the course.

The general sentiment here for the top four labels are that firstly, content is the most important to participants because it is indicative of whether one would be interested in the module. Secondly, teaching or the professors' efficacy is important to participants because a good professor can make content easily digestible, thus alleviating some of its difficulty. Thirdly, a rating of the workload generally allows participants to better plan for the overall workload of their course combinations for the term. Lastly, the difficulty of the course is important as it indicates the complexity of a course and the amount of work one would potentially need to finish.

"Satisfaction" is not as important because sentiments are based on personal experiences and is thus subjective. *"Grading"* was also not as important as most participants expressed indifference to their current Grade Point Average (GPA) as opposed to the offered material of the course. *"Job Oriented"* was also not as important due to the ever-changing industry requirements which can make this rating seem unreliable or obsolete. *"Would Recommend"* is the least important due to the same reasoning as *"Satisfaction"*. It was also noted that participants mentioned that *"Would Recommend"* would be better if it was supplemented with reviews from students who would recommend a course.

Additionally, there were two commonly misinterpreted labels *"Content"* and *"Difficulty"*. For *"Content"*, some participants had interpreted this label as the relevance of the content to themselves or the depth of the content, instead of the actual interpretation (refer to Appendix B). For *"Difficulty"*, some participants interpreted the label as how in-depth a course would be and the difficulty of the tests, however, *"Difficulty"* was meant to be indicative of the difficulty to grasp the course content such as due to its abstractness. These two labels would either require renaming or a tooltip with its definitions could be used so as to minimise misinterpretations in the final design.

Based on these findings, the team has decided to implement a rating system in the application that would feature these four prioritised categories as primary elements of the course rating functionality. By aligning the rating categories with students' preferences, the team aims to create a more user-centred and effective tool for course evaluation. This design choice ensures that the most relevant information is highlighted, allowing students to make better-informed decisions when selecting courses.

8.1.4 Scheduling Window Location

In this test, the team aims to evaluate two approaches for displaying timetables on the course enrolment page: the Separate Tab Design (refer to Figure 22) and the Collapsible Design (refer to Figure 20). Participants would be required to enrol in two modules that provide two possible classes each without having a schedule conflict. Participants will have the liberty of registering and deregistering in case of a mistake. The schedule will be kept up to date based on participant's decisions. Each half of the participants were given the design scenarios in different order. Between both design scenarios, class combinations are unique to minimise learnability of the previous answer and there exists only one possible solution for each scenario. The time it takes for a participant to enrol in both modules without timetable conflicts and their sentiments would be recorded.

8.1.4.1 Results

User feedback was split evenly between the two designs. Those who preferred the Collapsible Design appreciated the ability to view course information alongside the schedule for checking conflicts but found the schedule window difficult to locate once collapsed. Supporters of the Separate Tab Design felt it was more organised and less cluttered, though switching tabs was time-consuming. But most participants expressed their interest in having a schedule available while doing their course selection. This could be through using multiple tabs or the Collapsible Design, if it was dynamically adjustable.

Given these preferences, the team decided to integrate both methods. The design will feature a readily accessible timetable that displays essential information for course selection. This timetable may be collapsible or appear as a smaller view beside the course menu, allowing users to reference their schedule easily while selecting courses.

For those preferring a more structured layout, a detailed schedule with advanced features, such as filtering, will be available in a separate tab. This dual-option approach provides flexibility, enabling users to choose their preferred layout, enhancing overall satisfaction with the interface.

9 Prototype (High-Fidelity)

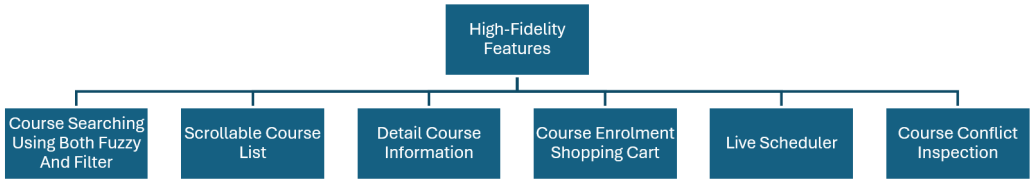


Figure 23: Features implemented in High-Fidelity Prototype

The high-fidelity prototype (https://github.com/agx-hv/50.006-UI-Project/) builds on the foundational features of the low-fidelity prototype, including search functionality, information display, and scheduling tools (refer to Figure 23). Additionally, it introduces new features namely, a "shopping cart" and a "friends" features, that aims to enhance user experience further. The "shopping cart" feature allows users to add courses and seamlessly enrol, mimicking the familiar online shopping experience. Furthermore, a "friends" feature enables users to view the courses their friends have enrolled in, fostering a sense of community. These enhancements are designed to streamline the registration process and support informed decision-making through collaborative insights.

9.1 Course Searching Mechanism

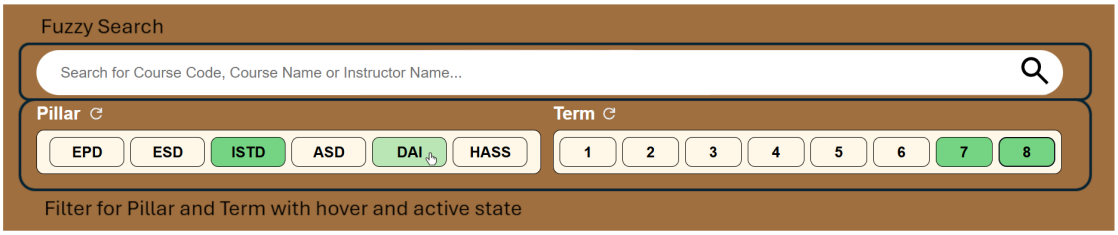


Figure 24: Both fuzzy search and filters for pillar and term are implemented in High-Fidelity Prototype

Building on insights gathered from the low-fidelity tests, a combination of fuzzy search and filter mechanisms was incorporated to create a more efficient course search experience that aligns with user expectations (refer to Figure 24).

9.1.1 Filters for Pillar and Term

From the low-fidelity tests, it was observed that students preferred filtering courses based on their pillar and term. To address this need, a toggle-style bar was designed for filtering, replacing the conventional dropdown menu that requires multiple clicks. This toggle functionality allows users to select filters with a single click, streamlining the process and making it more intuitive.

9.1.2 Fuzzy Search

The fuzzy search functionality was introduced to allow users to search for courses effortlessly using keywords related to course names, course codes, or instructors. This mechanism accommodates variations in user input and helps ensure that relevant results are retrieved even if the exact course name or code is not known.

9.1.3 Real-Time Results Rendering

While searching, the course list is rendered continuously (refer to Figure 25), this allow users to immediately see updates based on their search criteria or filters. This real-time feedback ensures that users can easily determine whether they have found the course they are looking for without needing to reload the page or navigate away.

9.2 Concise Course Information List

The course result list provides key information of each courses, including:

- Course Code
- Course Title
- Course Term Offered
- Course Pillar
- Instructor
- Track Specialisation (if applicable for the student)

By focusing on these critical details, the design avoids unnecessary clutter, ensuring that the interface remains clean and easy to navigate. This concise presentation allows users to quickly identify and select courses of interest without feeling overwhelmed.

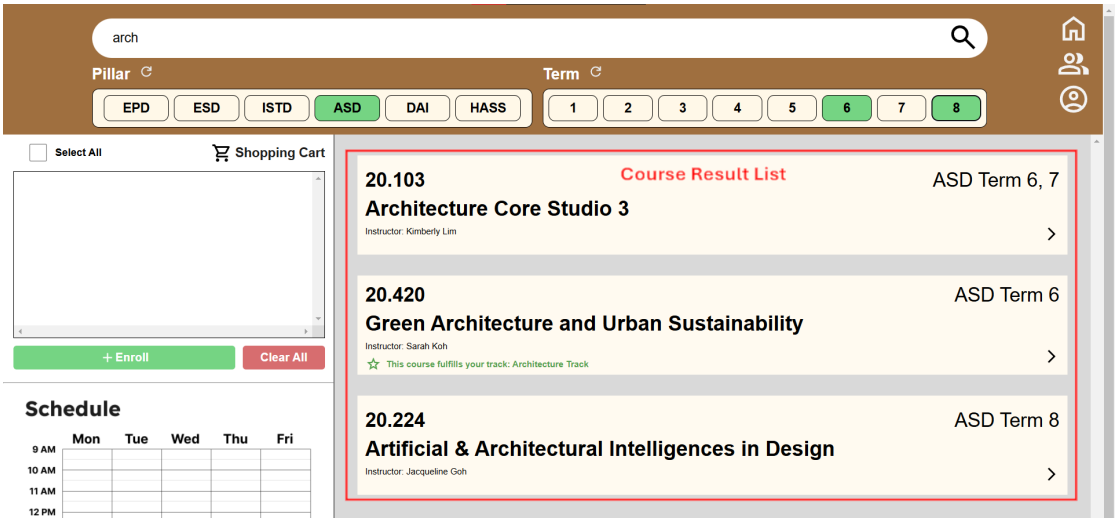


Figure 25: A list of relevant courses is shown when users perform searching

9.3 Detailed Course Information

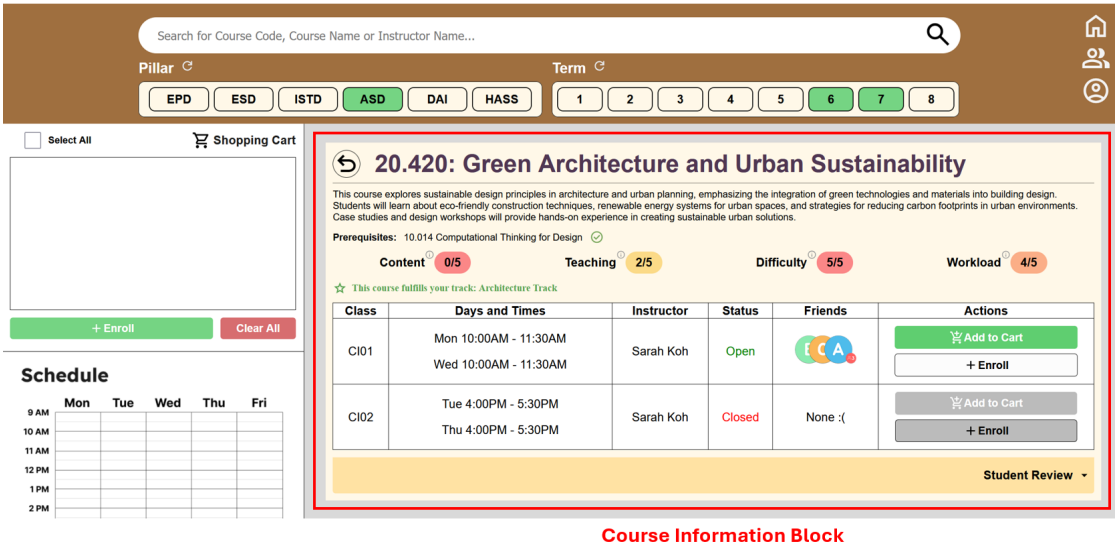


Figure 26: A more detailed course information is shown when users select a course from a list

When users select a course from the search results, they are presented with an information block (refer to Figure 26) that includes comprehensive information to aid their decision-making process. This design incorporates user feedback from low-fidelity tests to ensure clarity and usability.

The course information block provides the following details, ordered based on user priorities as identified during the low-fidelity tests:

1. **Course Description:**
   A concise overview of the course content, objectives, and focus areas. This section was prioritised as it helps students quickly understand the core details of the course.

2. **Ratings:**
   Quantitative ratings for key aspects of the course, structured to provide clear and valuable feedback.

3. **Timetable and Classes Offered:**
   Information on the available classes for the course, including time slots and options for enrolment.

4. **Student Reviews:**
   Qualitative feedback and sentiments from previous students, offering deeper insights into the course experience.

This sequence allows users to access the most critical details first while providing additional context as needed. Furthermore, the design also reduces the need for users to navigate through multiple tabs or systems as all relevant information is already consolidated inside the information block.

9.3.1 Ratings Design

Based on the low-fidelity test results, the top-ranked four labels were selected to structure the ratings:

1. **Content:**
   Evaluates the quality and relevance of the course material. It reflects how well the course covers its intended topics, meets learning objectives, and aligns with student expectations for depth, clarity, and structure. A higher rating indicates a course material that is highly relevant to the learning objectives.

2. **Teaching:**
   Focuses on the instructor's effectiveness in delivering the course material, including communication, organisation, support, and engagement. High ratings indicate that the instructor enhances the learning experience.

3. **Difficulty:**
   Measures how straightforward and accessible the course content is. Measures the complexity and challenge of the course content. A lower rating indicates the course is more straightforward and accessible, making it easier to understand. Conversely, a higher rating reflects a greater level of difficulty and challenge.

4. **Workload:**
   Assesses the amount of work required for the course. A lower rating indicates a lighter workload with fewer assignments, readings, and preparation. Conversely, a higher rating reflects a more demanding course requiring significant time and effort.

To address potential confusion about these labels, tooltips were implemented. When users hover over a label, they can view a brief definition of what each rating evaluates, ensuring clarity and consistency in interpretation (refer to Figure 27).

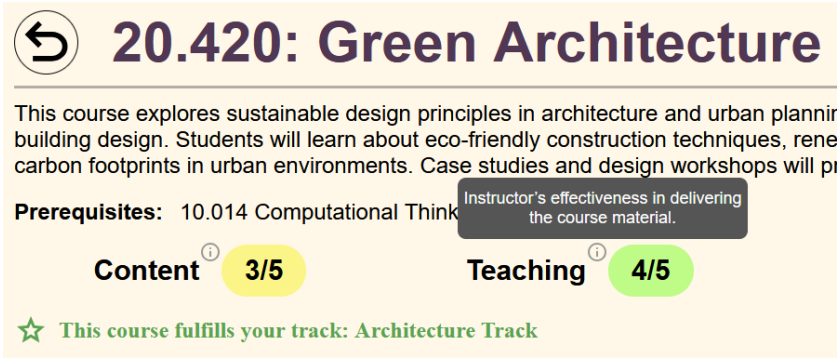


Figure 27: A short description about the rating will be shown when users hover to the information icon (tooltip)

9.3.2 Timetable and Friend Visibility

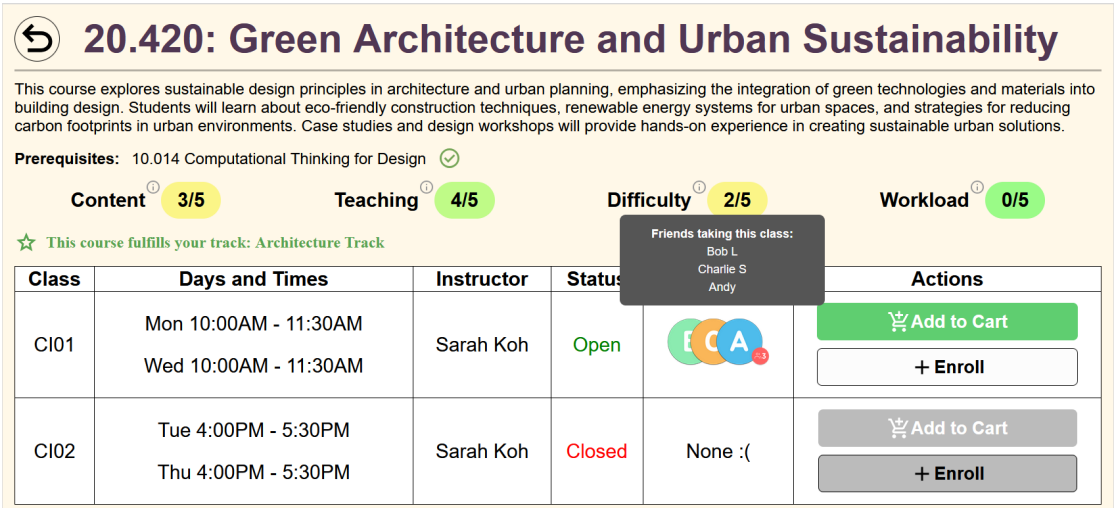


Figure 28: A list of friends will be shown when users hover to the friends icon

The classes offered are listed alongside their respective schedules, enabling students to plan effectively. Additionally, the system integrates a friend visibility feature, which shows users which of their friends have enrolled in each available class. This feature encourages collaboration and allows students to align their schedules with friends if they wish. For example, when selecting between Class 1 and Class 2 for a course, students can make an informed decision based on their friends' enrolments (refer to Figure 28).

9.3.3 Student Reviews

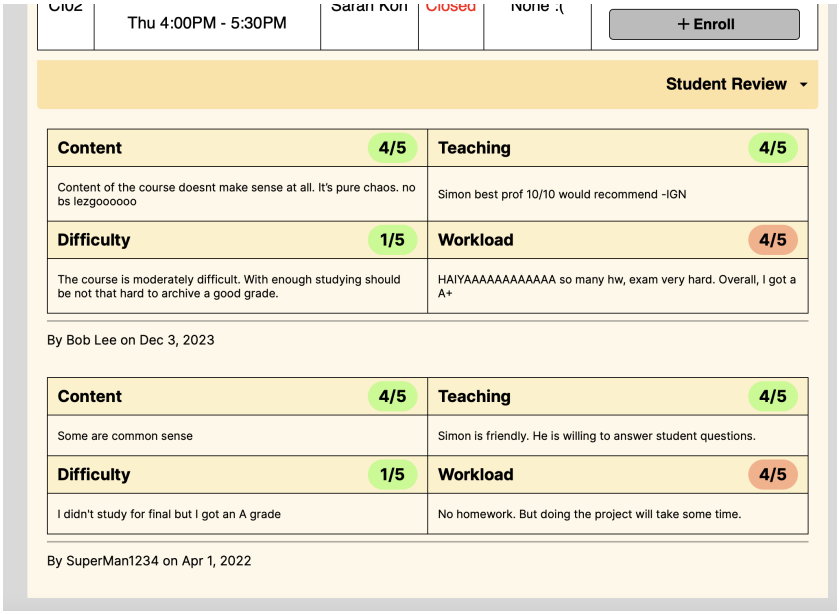


Figure 29: Student reviews of the course

The student reviews section provides qualitative insights into the course experience (refer to Figure 29). These reviews capture sentiments and detailed feedback from previous students, giving prospective students a well-rounded understanding of the course. This feature complements the ratings, allowing students to explore additional perspectives on topics such as teaching style, workload, and overall satisfaction.

9.3.4 Outcome

The course description design ensures a seamless and intuitive user experience. By presenting detailed yet concise information, leveraging user-centric ratings with clear definitions, and enabling social integration through the friend visibility feature, the system empowers students to make informed and confident decisions. This holistic design transforms the course selection process into an efficient and personalised experience, addressing key user needs identified during the low-fidelity tests.

9.4 Live Scheduler Integration during Course Enrolment

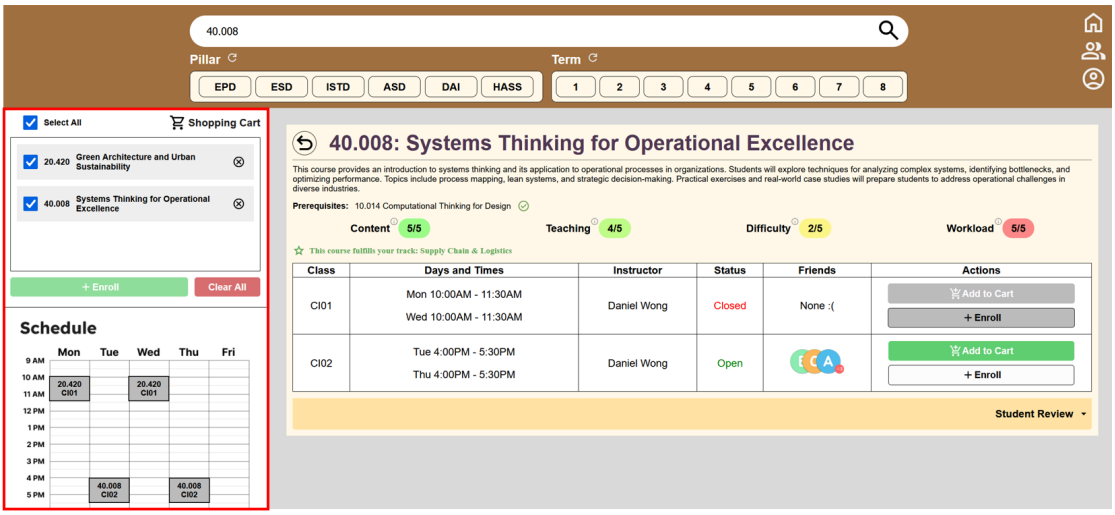


Figure 30: A grey block will be shown on the schedule when users select a class in the shopping cart

The course registration webpage is designed to allow students to easily manage their course selections while visually inspecting their schedules for conflicts. This design incorporates feedback from the low-fidelity tests, which revealed that students prefer to see their schedules dynamically while enrolling in courses.

When students add a classes to the shopping cart and select it, the live scheduler automatically updates to display a grey block for each selected class (refer to Figure 30). This real-time integration aligns the selected classes with the student's weekly timetable, allowing them to see how their choices fit into their overall schedule.

The grey-highlighted blocks on the live scheduler provide a clear, visual representation of the student's timetable. This feature enables students to:

- **Easily identify overlaps:**
  Students can immediately spot potential scheduling conflicts between their selected classes by comparing the grey blocks on the timetable.
- **Resolve issues proactively:**
  Before finalising their enrolment, students can make adjustments, such as selecting alternative classes or time slots, to ensure their schedule remains conflict-free.

This visual feedback ensures that students have full control over their timetable and can make informed decisions without needing to cross-reference multiple tabs or systems. This also addresses the common frustration of having to finalise course selections without seeing the bigger picture, ensuring that the enrolment process is stress-free and intuitive.

Once students are satisfied with their selections and have verified that their schedule is conflict-free, they can proceed to enrol directly from the shopping cart. This streamlined process, supported by the live scheduler's real-time feedback, ensures that students can confidently finalise their enrolment without needing to backtrack or resolve conflicts later.

9.5 Conflict Resolution in Enrolled Courses

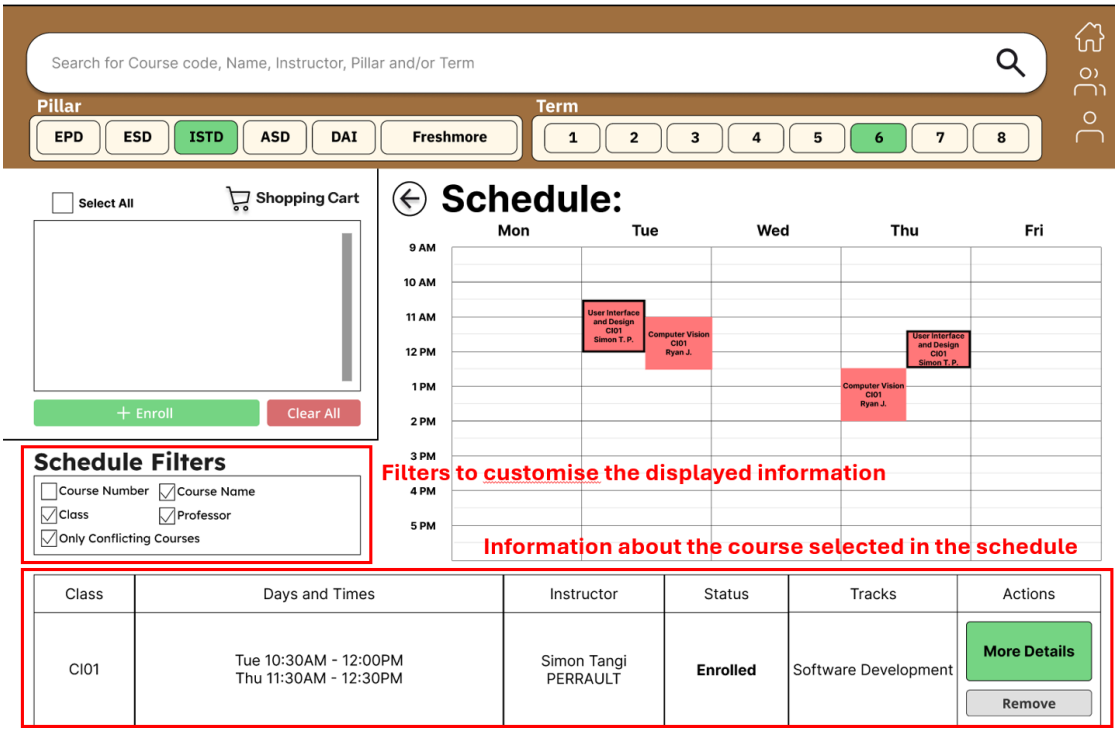


Figure 31: Detailed schedule page for addressing course conflict

The course registration webpage is equipped with a conflict resolution feature to help students manage scheduling conflicts in their enrolled courses (refer to Figure 31). This feature provides

clear visual cues and intuitive tools, ensuring that students can address issues efficiently and without frustration.

9.5.1 Deconflicting Process

When users enrol in courses that conflicts, the live scheduler will highlight the conflicting blocks in red, making the conflict immediately visible. This clear visual indication allows students to quickly identify where conflicts exist within their weekly timetable.

Moreover, the page provides several features to aid the process of resolving course conflicts:

- **Filters to customise the displayed information:**
  Students can prioritise showing only conflicted blocks to increase clarity. Furthermore, additional options allow them to toggle between different layers of schedule information, such as whether to show the full course name and the professor names.
- **Focused Conflict Management:**
  When users select the red block on the live scheduler, information about the specific conflict class will be shown in the table below the schedule, allowing students to focus on resolving those issues without distractions.

After clicking on the red block representing one of the conflicting classes, users can remove the class and free up the affected time slot. Then, users can return to the course details page or the shopping cart to select an alternative class that fits into their schedule without conflict.

9.5.2 Outcome

The conflict resolution system was designed to prioritise clarity and efficiency, ensuring students can maintain well-structured, conflict-free schedules. By leveraging visual cues, real-time feedback, and customisable tools in the detailed scheduler, the system empowers students to proactively address scheduling conflicts. Features such as visual conflict indicators and the ability to prioritise viewing only conflicted blocks reduce cognitive load, making the process intuitive and user-friendly.

9.6 Color and Visuals

Three different theme colors for the course enrolment page were proposed.

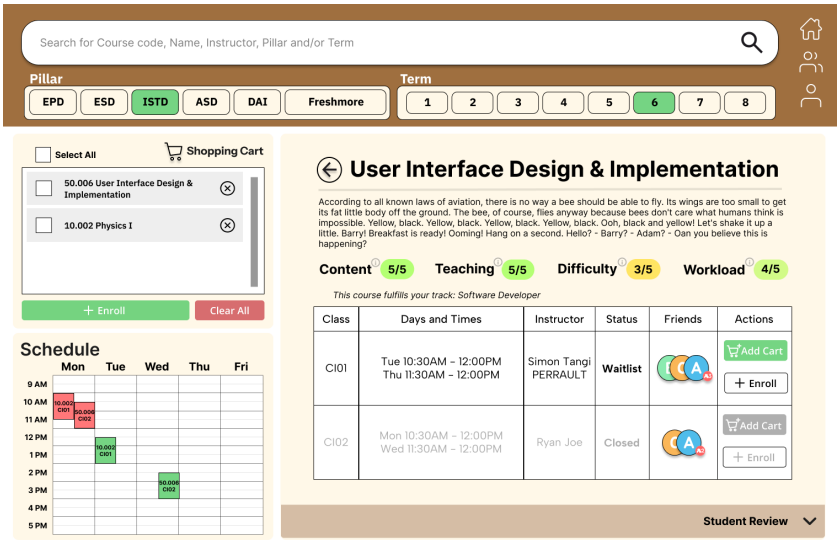


Figure 32: Brown-yellow theme

The brown-yellow theme, as shown in figure 32, was chosen for the initial design iteration to evoke a soft, earthy aesthetic. This colour palette aimed to create a calming atmosphere, reducing potential stress for students interacting with the interface.

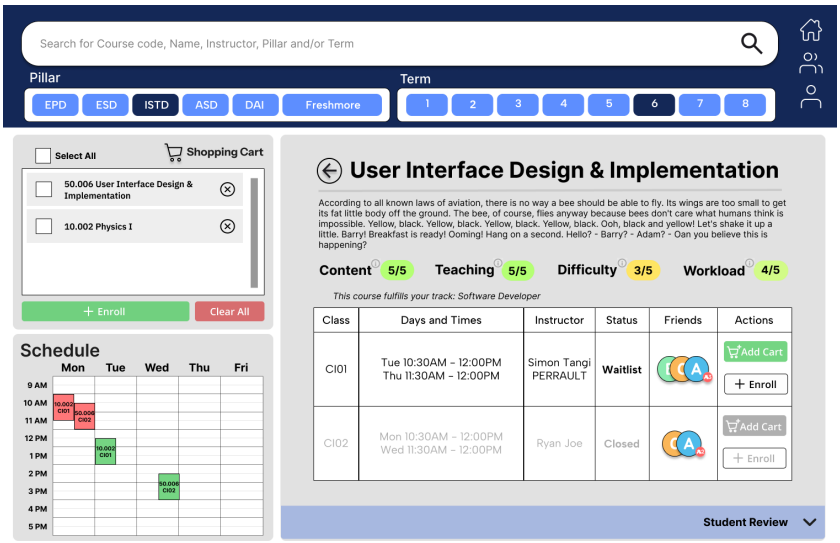


Figure 33: Blue theme

The Blue theme, as shown in figure 33 was created to invoke a more professional feel. Using dark blues and gray, the intention was to create a more subdued, straight forward design. It also aims to leverage on the sense of familiarity to existing Microsoft Office Suite designs.

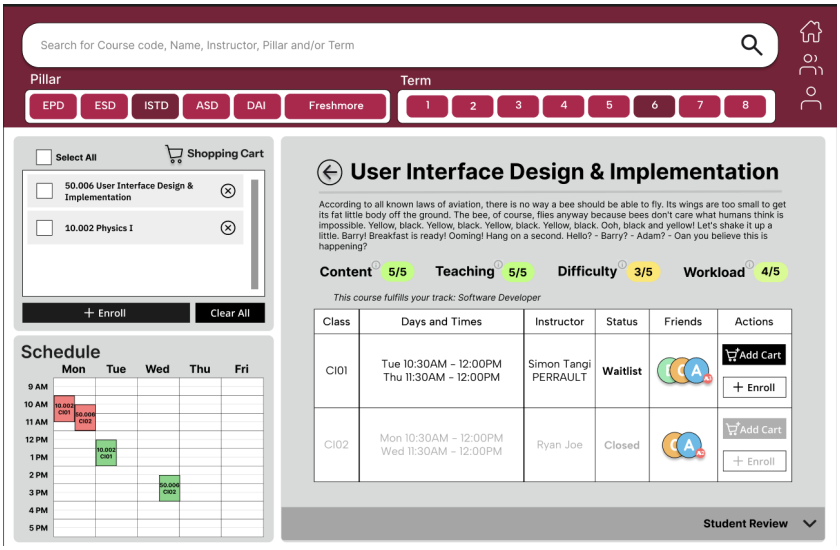


Figure 34: Red Theme

The Red theme as seen in figure 34 takes inspiration from SUTD's colours. This maintains a sense of familiarity amongst exisiting SUTD students.

10 User Testing (High-Fidelity)

The High-Fidelity test aimed to capture both quantitative and qualitative data, focusing on measuring the system's functionality and user satisfaction. The time taken for participants to complete each task was recorded and compared against the existing solution (MyPortal). The test sought to validate the final prototype solution by assessing it against the five quality components of usability (Times, 2020), as follows:

1. **Learnability:**
   The ease with which participants could complete tasks on their first interaction with the new interface.

2. **Efficiency:**
   The speed and accuracy with which participants completed tasks, highlighting how quickly users could achieve their goals.

3. **Errors:**
   The types and frequency of errors encountered during task execution, providing insights into potential usability issues.

4. **Memorability:**
   This component was excluded from this test due to the nature of the High-Fidelity test, where participants were introduced to the interface only once.

5. **Satisfaction:**
   Participants' subjective feedback on the ease of use, aesthetics, and overall experience with the interface.

It is important to note that these usability metrics are derived from user surveys, reflecting the participants' perceptions and sentiments. The results provide insight into how users experienced the interface, regardless of whether the system was objectively faster or more efficient. This focus on user perspectives ensures that the evaluation prioritises the real-world impact of the design on user satisfaction and perceived performance.

10.1 High-Fidelity Test

Four High-Fidelity tests were performed with 10 SUTD seniors. Each participant were tasked to complete the following tests, namely:

- Finding and enrolment of courses using MyPortal versus proposed interface
- Deconflicting of current enrolled courses
- Post-test survey on the usability and theme appearance

The High-Fidelity test will capture both quantitative and qualitative data, measuring functionality and user satisfaction:

- **Time-on-Task (Speed):** Time taken for users to complete the key tasks, such as enrolment and deconfliction.
- **Task Completion Rate:** The percentage of scenarios where users have successfully added and enrolled in courses without guidance.

- **Usability Sentiments:** Post-test surveys will collect user ratings on ease of use, appearance, and overall satisfaction. This would be conducted using the five quality components of usability excluding the memorability portion.
- **Observational Feedback:** Observers will note user behaviour, capturing moments of confusion to supplement quantitative data.

10.1.1 Finding a Course using Existing Solution (MyPortal)

To assess the time taken by participants to locate courses in the existing MyPortal system, each participant was tasked with finding two specific courses: *50.006 User Interface Design and Implementation* and *40.242 Derivative Pricing and Risk Management*.

10.1.1.1 Procedure

Participants were initially timed to determine how long it took them to search for the course code using online resources. Once these codes are known, participants were then tasked to search for them using the MyPortal interface.

They begin on the "Subject Enrolment" landing page, accessed via the MyPortal navigation bar (refer to Figure 35).

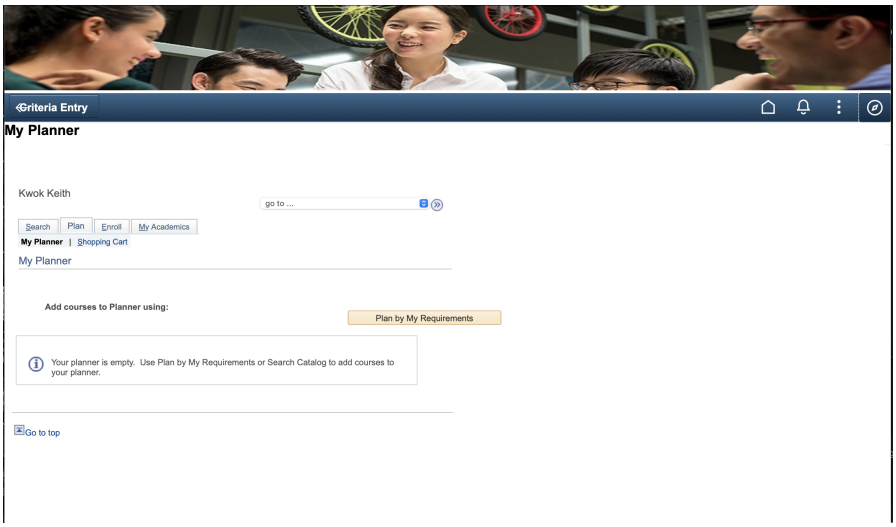


Figure 35: First landing page when a participant was to select "Subject Enrolment" from the home page of MyPortal.

From there, they were to navigate to the "Search" tab to locate the required modules (refer to Figure 36).

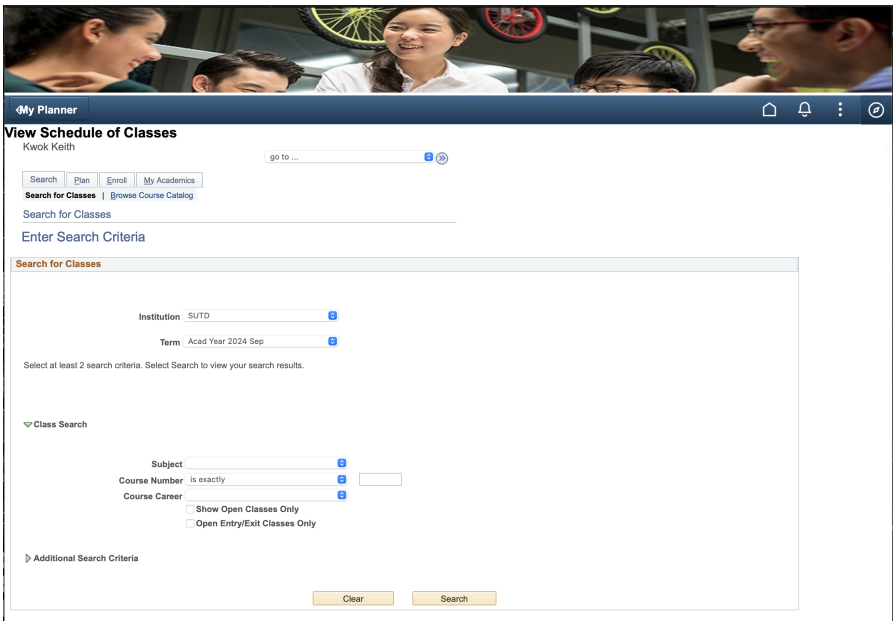


Figure 36: Search page of MyPortal

The total time taken to locate the first (t_1) and second course (t_2) using the course codes were recorded, capturing the duration from landing on the enrolment page to successfully finding the specified modules.

10.1.1.2 Initial Observations

Common mistakes made by participants included:

1. **Incorrect course number input:**
    - Participants were required to select "50" from a subject dropdown and then enter "006" as the course number. However, some participants mistakenly entered the full course number "50.006" in the course number field, bypassing the subject dropdown.
    - Others omitted the period required by the system, entering "006" instead of ".006," resulting in errors as the system requires an exact match.
2. **Difficulty locating the Search Tab:**
    - Many participants struggled to find the tab needed to navigate to the search page, causing delays and confusion.

These challenges underline the unintuitive design of MyPortal, which hinders efficient course navigation and enrolment.

10.1.2 Enrolment of Course using High-Fidelity Prototype

This test evaluated the effectiveness of the integrated course search mechanism, which allowed participants to perform fuzzy searches using course-related keywords while simultaneously filtering by pillars and terms to streamline their searches. Participants were tasked with enrolling in courses under two distinct methods: using the shopping cart feature and enrolling directly, across different scenarios.

1. **Shopping Cart Feature (Scenarios 1 and 2):**
   Participants were required to enrol in courses using the shopping cart feature. This feature was designed to be intuitive and familiar to users, allowing them to add multiple courses to a cart and finalise enrolment in a single action.

   - **Purpose** —The scenarios tested participants' ability to search and select courses efficiently while utilising filters.
   - **Data Collected** —The time taken to enrol in both courses (t_1 + t_2) along with the rate of successfully enrolling in the right courses were recorded.
   - **Hypotheses:**
     - **Null Hypothesis (H_0):** There is no significant difference in Total Enrolment Time between MyPortal and the proposed interface caused by the shopping cart feature.
     - **Alternative Hypothesis (H_1):** Participants take a significantly longer time to enrol in two courses using MyPortal compared to the proposed interface via the shopping cart feature.

2. **Direct Enrolment (Scenarios 3 to 6):**
   Participants were tasked with enrolling in courses directly. These scenarios included tasks requiring participants to enrol in courses with friends or locate courses using varying types of information, such as course descriptions or professor names.

   - **Purpose** —These scenarios tested how quickly and accurately participants could locate and enrol in courses without the cart feature, focusing on the effectiveness of the integrated fuzzy search and filters.
   - **Data Collected** —Enrolment time per course (t_1) and rate of successfully enrolling in the right course were recorded, along with observations of participants' ability to handle different search scenarios.
   - **Hypotheses:**
     - **Null Hypothesis (H_0):** There is no significant difference in Enrolment Time per course between MyPortal and the proposed interface if participants enrol directly.
     - **Alternative Hypothesis (H_1):** Participants take a significantly longer time to directly enrol in a course using MyPortal compared to the proposed interface.

10.1.2.1 Objectives

The primary aim of these tests was to validate whether the proposed interface, particularly the shopping cart feature, improves the speed and efficiency of course enrolment compared to the existing MyPortal system. It also aims to test the robustness of the search feature to different scenarios that students may face during their course enrolment process. Detailed descriptions of each scenario and their objectives can be found in Appendix C.

10.1.2.2 Methodology

Using a method similar to the Low-Fidelity Test results analysis in Section 8.1.1.1, a paired t-test was conducted for each scenario to compare the time differences between MyPortal and the proposed interface. For each individual *i*, the difference in search time d_i was calculated. The arithmetic mean of the time differences $\bar{d}$ and the sample standard deviation $\hat{\sigma}_d$ were then computed. Finally, the t-test statistic t was calculated and compared to a t-distribution with $n-1$ degrees of freedom to obtain the right-tail p-value $Pr(T \geq t)$.

Formulas used:

$$d_i = t_{\text{myportal},i} - t_{\text{hifi},i} \qquad \bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$$

$$\hat{\sigma}_d = \sqrt{\frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1}} \qquad t = \frac{d}{\hat{\sigma}_d/\sqrt{n}}$$

For shopping cart feature: $t_{\text{myportal}} = t_{\text{myportal},1} + t_{\text{myportal},2}$ $t_{\text{hifi}} = t_{\text{hifi},1} + t_{\text{hifi},2}$

For direct enromlent: $t_{\text{myportal}} = t_{\text{myportal},1}$ $t_{\text{hifi}} = t_{\text{hifi},1}$

10.1.2.3 Result - Speed

Scenario	Sample Size (n)	$\bar{d}$	$\hat{\sigma}_d$	p-value	Significant? ($p \leq 0.05$)
1 and 2	10	39.477	10.60634511	0.00000045	TRUE
3	10	29.132	11.61385552	0.00001185	TRUE
4	10	24.021	14.60728696	0.00028195	TRUE
5	10	35.306	9.20096517	0.00000035	TRUE
6	10	10.441	16.80291737	0.04049691	TRUE

Table 4: Significance of course enrolment time difference between MyPortal and proposed interface

Referring to Table 4, we reject H_0 ($p \leq 0.05$) in all scenarios. This suggests that the proposed interface is significantly more efficient at allowing participants to search for courses no matter the type of information given to them, which is expected due to the presence of fuzzy and filtering search elements derived from the various successes of the Low-Fidelity Prototype.

10.1.2.4 Observations - Speed

The increased speed observed when using the proposed interface can be attributed to several key factors:

1. **Effective Fuzzy Search for Structured Inputs:**
   The fuzzy search functionality excelled when participants were provided with structured information such as the course name, course ID, or the professor's name. In scenarios requiring this information, participants were able to locate and enrol in courses significantly faster than when using the current MyPortal system.

2. **Comparison with MyPortal:**
   For scenarios in MyPortal where the course name and course ID were provided, participants experienced a notably longer enrolment time due to the system's less intuitive search and navigation processes. In contrast, the proposed interface consistently yielded faster enrolment times with the same inputs, demonstrating its superior usability and efficiency.

3. **Performance in Complex Scenarios:**
   Even in more complex scenarios—such as confirming whether friends were taking the course or exploring course descriptions—participants completed enrolment faster using the proposed interface. This highlights the overall efficiency of the redesigned system, even when additional steps or considerations were required.

These results underscore the effectiveness of the proposed interface in streamlining the enrolment process across a variety of scenarios even though participants are familiar with the existing solution, MyPortal. This improved performance, even in scenarios involving additional tasks and constraints, reflects the intuitive design and robust functionality of the new system.

10.1.2.5 Result - Task Completion Rate

The team defines Task Completion Rate as such: $\frac{\text{Number of correctly completed scenarios}}{\text{Total completed scenarios}} \times 100\%$

Participant	Correctly Completed Scenarios	Total Scenarios	Task Completion Rate
1	5	6	83.3%
2	6	6	100%
3	6	6	100%
4	6	6	100%
5	6	6	100%
6	6	6	100%
7	6	6	100%
8	5	6	83.3%
9	6	6	100%
10	6	6	100%

Table 5: Results for task completion rate for course enrolment from the High-fidelity prototype

As shown in Table 5, the average task completion rate achieved in the high-fidelity testing was 96.7%, indicating a strong level of usability and task success across most scenarios.

The primary scenario where participants encountered difficulties was Scenario 6, which required them to discover relevant courses using only the course description. It is worth noting that this scenario represents a capability that the existing solution cannot deliver. The proposed interface's partial success in this scenario highlights the potential for improvement in its search functionality, specifically by integrating the ability to search by course description.

The average task completion rate of 96.7% is notably high, especially when compared to the assumed performance of the existing solution. For example, in a scenario where a new course is created and students only know the course name without its course code, the existing solution could reasonably be assumed to have a 0% task completion rate if participants are not given access to any other external resources due to the lack of a search functionality by course name (refer to Figure 36). This stark contrast underscores the significant advantage of the proposed interface in addressing gaps in usability and functionality present in the existing system.

10.1.2.6 Result - Sentiments

1. **Shopping Cart Feature (Scenarios 1 and 2):**
   The shopping cart feature was widely appreciated by participants during the testing phase. Observations revealed that the feature aligned well with users' existing mental models and familiarity with similar interfaces, contributing to its positive reception.

Notable observations included:

(a) **Streamlined Course Selection:** Participants utilised the shopping cart to select multiple courses before finalising their enrolment in one action, reducing the complexity of the process.

(b) **Active Schedule Integration:** The automatically updated active schedule allowed participants to visualise their selected courses (in cart) in real time. This facilitated the immediate detection of scheduling conflicts.

Overall, the shopping cart feature was consistently described as more efficient and user-friendly compared to the MyPortal system. Participants highlighted its ability to manage multiple courses simultaneously and visualise its schedules in a glance as a significant enhancement to the enrolment experience.

2. **Direct Enrolment (Scenarios 3 to 6):**
General feedback indicated that the combined fuzzy and filter search functionality provided a more intuitive and seamless experience compared to the current MyPortal system. Participants appreciated the scrolling feature on the search results page, which displayed only the most relevant course information, enabling them to quickly identify and select courses.

Scenario 4 and 5: Enrolling in Modules with Friends
In these scenarios, participants were tasked with enrolling in modules where they had agreed to take the course with their friends. While the system included a friends feature that displayed information about friends already enrolled in a class, some participants did not initially discover this functionality when clicking into a course. This was attributed to a lack of visual cues highlighting the friends system within the interface.

After being informed about the feature, participants were able to locate the friends information in the class details easily. This feedback emphasises the need to improve the visibility and prominence of the friends system, potentially through clearer visual indicators or callouts within the course selection interface.

Scenario 6: Discovering Courses Using Descriptions
Challenges were most evident in Scenario 6, where participants needed to find the most relevant course by relying on its description. The current fuzzy search functionality does not support keyword searches within course descriptions, making it impossible for participants to locate courses through this method. Observations showed that most participants instinctively entered descriptive keywords into the search bar, only to receive no results, leading to frustration.

This behaviour underscores the importance of integrating course descriptions into the fuzzy search capability. Such an enhancement would better align the system with user expectations and behaviour, particularly for discovery-driven tasks where course descriptions play a pivotal role.

In this scenario, participants were also provided with the course's possible pillars and the

term it was offered in. After realising that the course description did not work with the fuzzy search, many participants resorted to applying the filters for term and pillars. This demonstrated the value of the filter functionality, as it allowed participants to narrow down their search effectively despite the limitations of the fuzzy search.

These findings emphasise the dual importance of improving fuzzy search functionality by integrating course descriptions and ensuring robust filter options to complement the search experience.

10.1.3 Deconflicting of Current Enrolled Courses

This test aimed to evaluate the effectiveness of the proposed interface in resolving scheduling conflicts between enrolled courses. Participants were tasked with enrolling in two provided courses in such a way that the classes for these courses did not conflict.

10.1.3.1 Methodology

During the deconflicting test, participants were presented with a predefined scenario in which two courses were intentionally set to have scheduling conflicts. The task required participants to resolve the conflicts and re-enrol in the courses without any overlap. The time taken to complete the task, along with the steps taken to resolve the conflict, was recorded.

Participants followed a specific sequence:

1. **Identifying the Conflict:**
   Participants were to access the live scheduler, located at the bottom-left corner of the interface. This detailed schedule window visually highlighted the conflicting blocks, providing clarity on the overlap and enabling participants to identify the issue.

2. **Resolving the Conflict:**
   Participants were not given explicit instructions on how to resolve the conflict beyond the initial task briefing. Instead, they were required to independently discover the deconflict feature and determine how to remove one of the conflicting classes. Participants were free to choose which course to modify or remove. This approach tested the intuitiveness and usability of the deconflict feature and the interface.

3. **Re-Enrolling in Courses:**
   After resolving the conflict, participants were to navigate back to the search page to enrol in alternative classes, ensuring the updated schedule was conflict-free.

10.1.3.2 Result

This scenario tested the discovery and intuitiveness of the interface for participants resolving scheduling conflicts. Several observations were made regarding user behaviour and system interactions:

1. **Initial Interaction with Courses:**
   Most participants initially attempted to click on the course block to display more course details to view available class schedules (refer to Figure 25). While this functionality was not implemented in the prototype due to an oversight, it would be available in the actual

interface design. This highlights the critical importance of allowing users to review class schedules before beginning the deconflicting process, ensuring they have all necessary information to make informed decisions.

2. **Discovery of the Live Scheduler:**
   Participants eventually selected the live scheduler window on the bottom-left corner, though some delayed this action. This indicates that the existing visual cues were moderately effective but could benefit from enhancement. More prominent indicators, such as a highlighted or animated clickable icon, could make the live scheduler more immediately noticeable.

3. **Selecting Class Blocks:**
   Within the live scheduler, participants interacted with the conflicted class blocks. However, many mistakenly clicked "More Details" instead of "Remove" due to the more prominent visual design of the "More Details" option. This highlights the need for improved differentiation, such as using a saturated red colour for the "Remove" button to make its function clear and distinguishable.

4. **Returning to Search Results:**
   After removing classes, participants navigated back to the search results to enrol in alternative classes. Some participants reported difficulty in determining which courses they were still enrolled in. Adding a visual indicator in the search results to show already-enrolled courses could significantly enhance usability and reduce confusion.

5. **Use of the Live Scheduler for Deconflicting:**
   Participants frequently used the live scheduler to confirm whether new classes would conflict with their current schedule. If no immediate resolution was evident, they often enrolled in one class and returned to the live scheduler to remove the conflicting class manually.

6. **Key Insight for Future Design:**
   This scenario underscored the importance of a more streamlined deconflicting interface. For example:

   - Allow users to select multiple courses to resolve conflicts simultaneously.
   - Display a consolidated view of all available classes that would eliminate conflicts, enabling users to make selections without repetitive navigation.
   - Integrate the live scheduler into this process for real-time visual confirmation of potential conflicts.

These findings reaffirm the importance of intuitive navigation and adequate information access in the conflict resolution process. While the prototype's oversight did not reflect a flaw in the final design, it served to emphasise the value of ensuring users can review class schedules easily before resolving conflicts. Addressing these points in future iterations will significantly improve the deconflicting experience for users.

10.1.4 Usability Outcome

Below the team performed comparison between initial surveys of the usability of the course enrolment process and the resulting usability of the proposed interface. The following results would be based on the participants' perceived sentiment on using the proposed interface.

10.1.4.1 Survey Result

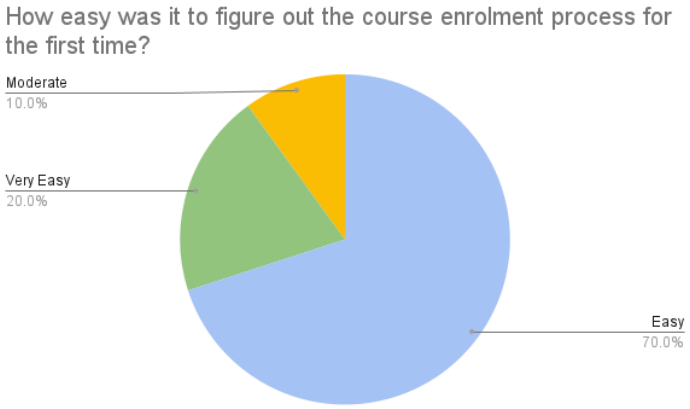


Figure 37: User perceived Learnability of the proposed interface

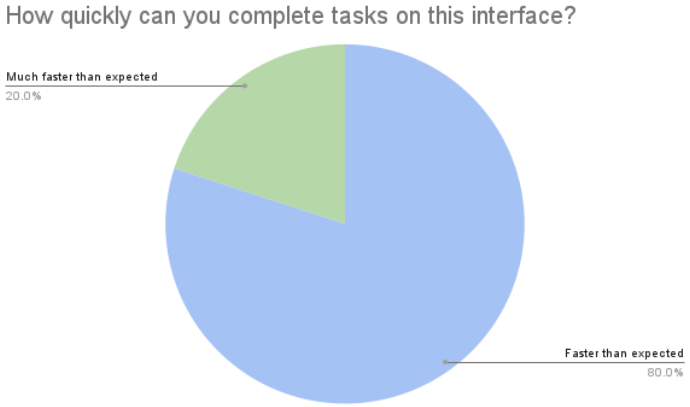


Figure 38: User perceived Efficiency of the proposed interface

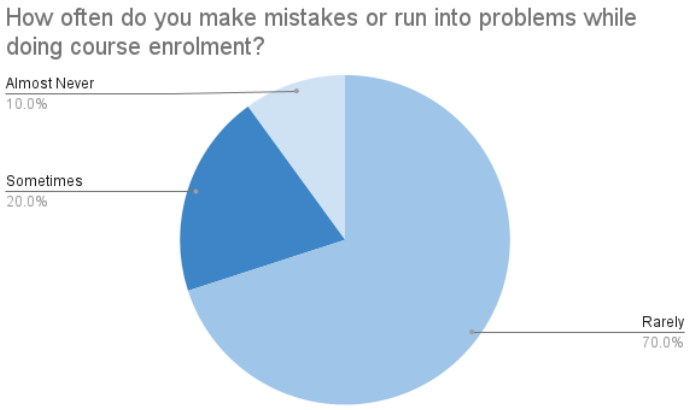


Figure 39: User perceived error rates of the proposed interface

Figure 40: User perceived satisfaction of the proposed interface

10.1.4.2 Usability Analysis

These heuristics were weighed based on the following scales:

Usability Heuristics	**Weights**				
	1	**2**	**3**	**4**	**5**
Learnability	Very Difficult	Difficult	Moderate	Easy	Very Easy
Efficiency	A lot longer than expected	Longer than expected	About the time I expect	Faster than expected	Much faster than expected
Error Rates	Almost Never	Rarely	Sometimes	Often	Very Frequently
Satisfaction	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied

Table 6: Mapping of survey responses to weights for usability heuristics, where each weight corresponds to a level of agreement or frequency for criteria like Learnability, Efficiency, Error Rates, and Satisfaction.

With these mappings (refer to Table 6), the following comparison of usability heuristics were obtained between the existing course enrolment interface and the proposed interface.

Usability Heuristics	Existing Interface	Proposed Interface
Learnability	3.0	4.1
Efficiency	2.81	4.2
Error Rates	3.21	2.1
Satisfaction	2.08	4.4

Table 7: Usability Heuristics weight outcomes comparison between existing interface and proposed interface

As shown in Table 7, the proposed interface outperforms the existing interface across all tested usability heuristics —Learnability, Efficiency, Error Rates, and Satisfaction.

Learnability:

- The proposed interface scored 4.1 compared to 3.0 for the existing system, indicating that it is significantly easier for users to understand and operate.
- Surveys revealed that participants appreciated the visual cues that enhanced their familiarity with the system. They found the interface more intuitive than the existing one.

One participant even remarked that the design was the "Best design ever for course enrolment."

Efficiency:

- With a score of 4.2 versus 2.81, the proposed system enables users to perceive tasks completion as quicker and with less effort.
- Participants noted that the proposed interface avoided clutter by displaying only relevant information at each stage of the enrolment process.
- They also found the enrolment process faster, with the search and filtering functionality being more intuitive and user-friendly.

Error Rates:

- The reduction in perceived error rates from 3.21 to 2.1 highlights the improved intuitiveness and reliability of the new interface.
- Errors primarily arose from challenges with discovering the friend system and navigation issues during the schedule deconfliction task.
- Limitations in the High-Fidelity prototype, implemented in Figma, contributed to these errors. For instance, certain actions like accessing course details were not available, frustrating participants. These limitations would not exist in the final product.

Satisfaction:

- The most notable improvement is in satisfaction, with the proposed interface scoring 4.4 compared to 2.08 for the existing system.
- Participants highlighted several factors that contributed to their satisfaction:
  - **Ease and Intuitiveness:**
    The fuzzy and filter searching mechanism enabled partial searches and demonstrated greater tolerance for minor input errors, significantly improving the user experience.
  - **Friend System:**
    This feature allowed users to easily identify which classes their friends were enrolled in. This capability was particularly valued by participants who preferred to enrol in courses only if their friends were attending the same classes.
  - **Shopping Cart Feature:**
    Participants found the shopping cart feature particularly intuitive and user-friendly. It enabled them to:
    * Consolidate all their desired courses into a centralised area
    * Have the ability to enrol all their desired courses in one action.
    * Check for schedule conflicts before finalising enrolment.

    Additionally, participants appreciated the familiar design, which made the feature easy to understand and use effectively.

These results demonstrate that the proposed interface aligns more closely with user expectations and usability principles, providing a significantly improved course enrolment experience. The enhancements in Learnability, Efficiency, Error Rates, and Satisfaction underscore the effectiveness of employing a user-centric design approach. The iterative testing process played a crucial role in refining the interface, ensuring it meets the needs and preferences of users, and ultimately delivering a superior solution.

10.1.5 Interface Theme

Three theme designs were presented to users for evaluation: a Brown-yellow theme (refer to Figure 32), a Blue theme (refer to Figure 33), and a Red theme (refer to Figure 34).

Theme	Count
1 (Brown-yellow)	5
2 (Blue)	3
3 (Red)	2

Table 8: Outcomes of theme survey

As shown in Table 8, the Brown-yellow theme emerged as the most preferred, with five out of ten participants selecting it as their favourite. Users expressed that this theme provided a visually pleasing experience, citing the harmonious blend of the yellow background with the brown headers as a key factor in their preference. The subtle contrast between these colours was described as "inviting" and "easy on the eyes," contributing to a sense of comfort while interacting with the interface.

The Blue theme, chosen by three out of ten participants, was appreciated for its modern and clean aesthetic. It also expressed familiarity due to its closeness to Microsoft Teams. Some users described it as "calming" and "professional," though a few noted that the colour palette felt too conventional and lacked the warmth provided by the Brown-yellow theme.

The Red theme, selected by two out of ten participants, was recognised for its bold and striking appearance. Interestingly, while some users initially described it as "distracting", while others appreciated its connection to SUTD's school colours. This sense of familiarity resonated with some participants, who felt it subtly reinforced the institutional identity without being overly intense or out of place.

11 Reflection

The project to enhance the course enrolment process at SUTD highlights a comprehensive effort to address users' needs, ensuring that the interface is intuitive, efficient, and user-centric. With students already facing stress from academics, the goal of the design was to curate a smoother process and avoid additional stress or frustration. By integrating features such as prioritised course descriptions, tooltips for rating labels, and a "Friends System", the design successfully reduces user friction and promotes informed decision-making. However, there remain areas for reflection and potential improvement.

11.1 Project Reflections

1. **User-Centric Design:**
    - The prioritisation of course descriptions and the inclusion of features such as the "Friends System" were well-aligned with student preferences. These additions effectively bridge together functionality and user needs, addressing gaps within existing solutions.
    - Insights gathered from low-fidelity tests provided a robust foundation for iterative improvements, culminating in a high-fidelity prototype that resonates with the target audience.
2. **Data-Driven Decisions:**
    - The use of weighted scores to prioritise categories of information underscores the value of evidence-based design. This approach not only validated the emphasis on course descriptions but also highlighted the relative importance of other elements like ratings and timetables.
3. **Visual Aesthetics:**
    - While the project's initial priority focused on implementing core functionalities over visuals, subsequent tests highlighted user feedback emphasizing aesthetics, including window layouts, colours, and button designs. This input was incorporated into the high-fidelity prototype, resulting in visual improvements that enhanced the overall user experience.
4. **Engagement and Feedback:**
    - Incorporating iterative user tests and qualitative feedback facilitated informed decisions regarding feature implementation, such as student reviews. By addressing user needs identified through surveys and testing, the decision-making process became more user-focused. For instance, the relatively low priority given to reviews highlights a need to reevaluate their presentation or framing to better align with user expectations and priorities.

11.2 Future Improvements

1. **Dynamic Personalisation:**
    - Introduction of adaptive elements that tailor the interface based on user profiles or previous interactions. For example, senior students could see priority tracks and advanced modules, while Freshmore students might receive recommendations for exploratory courses.
2. **Enhanced Social Features:**
    - Extension of the "Friends System" to include real-time notifications when friends enrol in new courses and not just visibility at course enrolment. This would foster greater collaboration and engagement.
    - Integrating a broader "Friends System," allowing users to create course groups or view overlapping enrolments across multiple courses.
    - **Enhancing Friends System Visibility:**
      Introduce visual cues, such as icons or banners, within course details to draw attention to friends already enrolled in a class. Enhancing the design's visibility would address the issue of users overlooking it when skimming through course information, ensuring key details are more easily noticed and accessible.
3. **Conflict Resolution Automation:**
    - Build upon the deconflict feature by automating the process of resolving schedule clashes. Suggestions for alternative classes or course combinations could be dynamically generated, reducing manual intervention. The dynamic personalisation would also allow students to change between their preferred layout to better visualise their schedules.
4. **Integration of Reviews:**
    - A system that reevaluates the student reviews section to increase its perceived value. This could include curated highlights of key sentiments, visual summaries, or AI-driven insights that summarise common themes from reviews.
5. **Accessibility and Inclusivity:**
    - Expansion of the accessibility features such as multi-language support for exchange students or enhanced tooltips for users unfamiliar with academic jargon.
    - Incorporating features that address the needs of users with disabilities, ensuring compliance with web accessibility standards.
6. **Mobile Experience:**
    - Developing a dedicated mobile application that mirrors the desktop experience while leveraging mobile-specific features such as push notifications for enrolment updates or on-the-go timetable management.
7. **Feedback Telemetry:**

- Introduction of mechanisms for the system to collect feedbacks from users post-enrolment. Insights into how students feel about their courses enrolment experience could inform iterative refinements to the course enrolment system such as the rating and recommendation systems.

8. **Integrating Course Descriptions into Fuzzy Search:**

   - Enable the search functionality to include keywords from course descriptions. This improvement would significantly enhance the system's usability for discovery-driven tasks, where users rely on descriptive information to locate courses.

9. **Improved Deconflicting Workflow:**

   - Redesign the deconflicting process to allow users to select multiple courses for conflict resolution at once. The system could display all possible combinations of class schedules that avoid conflicts, providing a more streamlined and efficient user experience. There would also be options for students to unenrol in conflicting courses and enrol in another course simultaneously, removing the extra step of going back to the previous tab to enrol in another class.
   - The live scheduler should always be displayed in the deconflicting workflow, allowing users to visually confirm and resolve potential conflicts in real time.

10. **Improved Class Enrolment Feedback:**

    - Add visual indicators within the search results page to show which courses the user has already enrolled in. This enhancement would reduce confusion and improve the clarity of the enrolment status for participants.
    - Introduce a feature that displays a temporary class block on the live scheduler when users select a class block from the course detail page. This functionality, currently limited to the shopping cart feature, would provide real-time feedback and help users better visualise their schedule adjustments during the selection process.

11.3 Personal Reflections

1. **Kwok Keith**
   This project has deepened my appreciation for designing intuitive user interfaces tailored to specific users. As the project leader, I ensured alignment within the team, and I am immensely grateful for my team's dedication, without which this project's success would not have been possible. Reflecting on my role, I recognise that better consideration of my teammates' commitments to other modules could have helped me better understand and support their capacities during the term.

   This project pushed me out of my comfort zone, from presenting to a Freshmore class and administering surveys to conducting interviews that honed my insight-gathering and interpersonal skills. Working with a team of international students provided valuable perspectives and cultural insights, highlighting the importance of embracing diverse viewpoints to enrich our work. Beyond achieving our goals, I've built meaningful connections with my teammates.

In conclusion, this project was an invaluable experience in understanding the challenges of user interface design, the effort required to achieve meaningful outcomes, and the growth that comes from stepping out of one's comfort zone.

2. **Jon Koo Jia Jun**
   Working on the high-fidelity prototype for this project was a highly enriching and insightful experience. Collaborating with Quentin who was responsible for the frontend design in Figma and its implementation in HTML, CSS, and JavaScript gave me a deeper appreciation for the challenges of translating static designs into functional, interactive interfaces.

   My primary contribution involved creating a backend web server using Go (Golang) to support the dynamic features required for the prototype. This backend handled the implementation of fuzzy searches and search filters for course searching—one of the core functionalities of the system. To ensure seamless interactivity and responsiveness, I incorporated HTMX in the frontend, which allowed the prototype to utilise stateless AJAX RESTful HTTP POST requests. This approach provided a lightweight and efficient way to integrate the backend with the frontend, enabling real-time updates without requiring full page reloads.

   Additionally, I collaborated with Quentin to modify the HTML, JavaScript, and CSS to enhance the functionality and interactivity of the prototype. This collaboration taught me the importance of clear communication and alignment between the frontend and backend during the development process. By working closely with the team, I was able to ensure that the backend seamlessly supported the visual and user experience goals of the project.

   This experience also allowed me to reflect on the intricacies of real-world production environments, where UI design and engineering are often handled by different teams. I realised the importance of designing backend systems that are flexible and adaptable to frontend requirements, as well as the value of considering implementation challenges during the design phase.

   Overall, this project not only strengthened my technical skills in Go and HTMX but also deepened my understanding of the collaborative dynamics required to bring a design to life as a functional product. It has inspired me to approach future projects with a more holistic perspective, ensuring that both user experience and system functionality are prioritised in equal measure.

3. **Ryan Javier**
   With a specific interest in the thought processes behind how users interact with technology, I feel that this project has allowed me to gain a deeper understanding of the decisions users make when interacting with a new interface. What I found particularly surprising was the number of features that the team thought was intuitive enough but subsequent tests revealed that users were having a hard time identifying them. These features included the friends and rating system. This taught me that as UI designers, we can never take anything for granted, and to utilize user testing as much as we can.

Given the tediousness of Figma, much of the section of the prototype that I worked on required many connections and "hard coding" specific scenarios for the low fidelity prototypes. This has made me curious if there are functionalities within Figma that can make this more efficient that I do not know of. I plan to further explore Figma and other prototyping software in the future to find improved ways to create prototypes.

4. **Tristan Kwok**
   User interface being one of the most interacted aspects of any system, has always interested me to explore more and this project has done exactly that. I have learnt to gain more appreciation towards interface designers in ways that they can generalise user feedback into more features. I have learnt to use tools like Figma to materialise concepts into prototypes. Although Figma is not without its faults, it is generally a very effective way of rapid prototyping and concept testing. Coming from an engineering background has also helped me contribute to grounding the scale and features of the prototypes, which significantly sped up the testing process.

   Even with all the planning ahead of time, we went beyond what we had imagined. It tested my time management skills and forced me out of my comfort zone to learn new tools while having to work with them at the same time. I plan on exploring more front-end programming in HTML and CSS in the future to further hone my skills in project scoping. Overall this is an unforgettable and priceless experience that will surely help me grow more in a real-world production setting.

5. **Quentin Lee**
   Course searching is one of the most essential features when designing our prototype. In consideration of this, Figma will not be a suitable implementation for our high-fidelity prototype. This implies that we need to build a dynamic website using HTML, CSS, and JavaScript so that our team can implement some back-end coding to support the searching and filtering of courses. Doing front-end coding is an exhausting task, not to mention if the UI design in Figma is difficult to implement in HTML. Luckily, as I am also responsible for designing the initial UI of the high-fidelity prototype, I considered front-end coding before I made the design, which allowed me to work with HTML and CSS smoothly during the process. This allows me to experience the difficulties that front-end engineers may face as user interface design and front-end coding are separated in real-life production.

11.4 Conclusion

This project has successfully addressed critical pain points in the SUTD course enrolment process, offering a more seamless and user-friendly interface. However, the dynamic and evolving nature of user needs presents opportunities for continuous improvement. By focusing on personalisation, automation, and inclusivity, future iterations can further refine the system, ensuring it remains a benchmark for intuitive course selection and enrolment.

References

Rate My Professors (2024). Rate my professors. https://www.ratemyprofessors.com/. Accessed: 2024-11-15.

Singapore University of Technology and Design (2024). Myportal. https://myportal.sutd.edu.sg. Accessed: 2024-11-11.

The Hong Kong University of Science and Technology (2024). Class schedule & quota. https://w5.ab.ust.hk/wcq/cgi-bin/2410/. Accessed: 2024-11-15.

Times, T. (2020). 5 attributes of usability. Accessed on November 29, 2024.

USTSPACE (2024). Ustspace . https://ust.space/. Accessed: 2024-11-15.

A Appendix A

1. **ISTD Scenario (Course Title, Term, Professor)**
   You're passionate about learning how to protect online data and have previously looked into a course called "Data Privacy and Security". You want to find out more about it and see if it fits into your schedule. It's taught by Professor John Lim in Term 8.

2. **ASD Scenario (Course Title, Term, Professor)**
   You recently spoke to a professor who recommended a course called "Sustainable Urban Design" because of your interest in urban sustainability. It's taught by Professor Aisha Tan in Term 6. Find this course.

3. **ESD Scenario (Term, Professor, Pillar, Description)**
   You're interested in improving your skills in logistics and have been looking for a course for it. You heard about it in passing during a lecture, and it's taught by Professor Benjamin Wong in Term 7 under ESD. Find a course that fits this description.

4. **EPD Scenario (Description, Incomplete Title, Pillar, Term)**
   A professor recently encouraged you to explore courses on renewable energy, and you're curious about the course that you vaguely remember to be Renewable Energy (something) under EPD. You know that it is taught in Term 5. Find a course that fits this description.

5. **DAI Scenario (Description, Pillar, Term)**
   You've been keen on exploring how AI can impact design ever since you heard about it in a guest lecture. Curious, you want to find out if DAI or ISTD offers any course with similar learning outcomes in Term 8.

6. **HASS Scenario (Description, Title, Pillar, Professor, Term)** You enjoy learning about global issues and have always been intrigued by politics. You recently heard about a course titled "Global Politics and Society" under HASS, taught by Professor Michael Lee, which piqued your interest. It's available in Term 6.

7. **Freshmore Scenario (Title, Term, Professor)** You're a Freshmore student, and during an advising session, your professor suggested you take "Introduction to Engineering Systems" in Term 4 to build a strong foundation for your engineering path. It's taught by Professor Rachel Koh.

B Appendix B

- **Content:** Evaluates the quality and relevance of the course material. This rating reflects how well the course covers its intended topics, its learning objectives, and whether the content meets students' expectations for depth, clarity, and structure.
- **Satisfaction:** Measures overall student satisfaction with the course experience. This could include the course's organization, engagement level, and whether it met students' personal goals or interests. This is based on the student's review rating.
- **Workload:** Assesses the amount of work required for the course. A high rating may indicate a manageable or light workload, while a lower rating suggests a more intensive time commitment, including assignments, readings, and preparation.
- **Simplicity**: Measures how straightforward and easy to grasp students found the course content. A higher rating indicates that students perceived the course as clear, well-structured, and uncomplicated, making it accessible to a wider range of learners. Lower ratings might suggest that the course includes complex or dense material, requiring additional time and effort to understand fully.
- **Teaching:** Focuses on the instructor's effectiveness in delivering the course material, including communication, organization, support, and engagement. High ratings indicate that the instructor enhances the learning experience.
- **Grading:** Evaluates the fairness and transparency of the grading system. A higher rating suggests that grading criteria are clear, fair, and consistent, while lower ratings may indicate perceived grading issues.
- **Would Recommend:** Reflects the percentage of students that would recommend the course to others based on their overall experience, learning outcomes, and applicability of the course content.
- **Job Oriented:** Assesses how well the course prepares students for careers, providing skills, knowledge, or networking opportunities relevant to the job market or specific professions. A higher rating implies strong career relevance.

C Appendix C

Participants are required to perform Scenario 1 and 2 using the shopping cart feature.

- **Scenario 1: Enrolling with a Course Name (Green Architecture and Urban Sustainability, ASD)**
  You are interested in a course called "Green Architecture and Urban Sustainability" and wish to enrol in it. Search for the course using the course name and complete the enrolment process.

  Objective: Evaluate the user's ability to locate and enrol in a course using the course name as the primary search criterion, ensuring the interface allows for quick and intuitive navigation based on course titles.

- **Scenario 2: Enrolling with a Course ID (Systems Thinking for Operational Excellence, ESD)**
  Your friend recommended a course with the ID 40.008. Use the course ID to find the course and enrol in it.

  Objective: Test the system's efficiency in handling precise inputs like course IDs, ensuring users can quickly find and enrol in a course when provided with unique identifiers.

Participants are required to perform the remaining scenarios by enrolling directly.

- **Scenario 3: ISTD Pillar Module with Professor's Name (Machine Learning for Cybersecurity, ISTD)**
  You want to take an ISTD module taught by Professor John Lim. Search for the professor's name and find any course under the ISTD pillar taught by him. Enrol in it.

  Objective: Assess the user's ability to search for courses using instructor details, verifying the interface's capability to filter courses by professors and display results accurately within a specific pillar.

- **Scenario 4: AI-Related Course (Artificial Intelligence for Creative Problem Solving, DAI)**
  You're eager to dive into artificial intelligence and have planned to enrol in a course related to AI this term. Your friend Bob agreed to take this module with you, you know that he has enrolled in that module but he's currently unresponsive and hasn't shared the course details.

  Objective: Test the user's ability to make independent decisions when enrolling in a course related to their interests, even with incomplete information, and evaluate how well the system supports keyword-based searches.

- **Scenario 5: Enrolling with friends in same CLASS (Cultural Narratives in Global Media, HASS)**
  Your friend is taking a course called "Cultural Narratives in Global Media" this term. You want to join them in the class. Search for the course and enrol in it.

Objective: Examine how effectively the system allows users to locate and enrol in a course their friend is taking, testing the ability to search using course names and confirm enrolment compatibility.

- **Scenario 6: Discovering relevant course using its description (Creative AI in Design, DAI)**
  You've been keen on exploring how AI can impact design ever since you heard about it in a guest lecture. Curious, you want to find out if DAI or ISTD offers any course with similar learning outcomes in Term 8. Enrol in the course that allows you to learn more about how AI can impact design.

  Objective: Evaluate the user's ability to search for and identify a course within the two pillars DAI and ISTD using the course description.