COMP132: Advanced Programming
Programming Project Report

One-to-one Tutoring Center Management System

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FALL 2022

PART 1

General Demo Information

1. List of Users

Admin:

- iamadmin (username), please123 (password)

Tutors :

Tutor Level	Username	Password	Name
A	smart_one	emc2	Albert Einstein
A	math_god	math	Leibnitz
A	math_pro	e	Euler
A	psycho	ax	Patrick Bateman
A	heisenberg	family	Walter White
A	master	password	Jackie Chan
B	not_batman	iamrich	Bruce Wayne
B	33cars	romania	Andrew Tate
B	facebook	lizard12	Mark Zuckerberg

All tutors have a unique profile picture in their personal info panel.

Students:

Students are generated automatically using this method:

```
private void initializeStudents() {
      for (int i = 0; i < 120; i++) {
            new Student(
"username" + i, "password" + i, "name" + i, "1234567" + Integer.toString(8901 +
i),
                        i % 2 == 0 ? "Male" : "Female", random.nextInt(15) +
17);
      }
      for (Student student : system.getStudents()) {
            student.setBalance(new Money(random.nextInt(1000000) + 200000));
}
```

So, every student has the following usernames and passwords for $x \in \{0, 1, \dots, 119\}$:

- username***x***, password***x***

(for example, first student's username is username0 and password is password0)

They also have name***x*** and have a random age between 18 and 31 and a random 11-digit TCKN.

2. Equipment Information

Equipment Name	Equipment Price (TL)	Cut Percentage To System (%)
General Physics Textbook	320	20
Calculus Textbook 10^{th} ed.	200	15
Get Rich Book	490	2
Notebook	20	30
Erlenmeyer Flask	50	10
Lab Coat	350	15
Laptop	1000	18

3. Course Information

Type	Name	Prerequisites	Required Equipments	Registered Tutors
Beginner	MATH 106	None	Calculus Textbook 10th ed.	Leibnitz, Albert Einstein, Euler
Beginner	MATH 107	None	None	Leibnitz, Albert Einstein, Euler
Beginner	CHEM 103	None	Lab Coat	Walter White, Bruce Wayne, Patrick Bateman
Beginner	COMP 100	None	Laptop	Mark Zuckerberg, Andrew Tate, Bruce Wayne
Beginner	MRKT 220	None	Notebook	Walter White, Andrew Tate, Bruce Wayne, Patrick Bateman, Mark Zuckerberg
Beginner	UNIV 199	None	Laptop	Mark Zuckerberg, Andrew Tate, Walter White
Beginner	PHYS 101	None	General Physics Textbook	Albert Einstein, Leibnitz, Bruce Wayne
Beginner	PHYS 102	PHYS 101	General Physics Textbook	Albert Einstein, Mark Zuckerberg, Jackie Chan
Advanced	MATH 203	MATH 106, MATH 107	Calculus Textbook 10th ed.	Leibnitz, Albert Einstein, Euler
Advanced	MATH 204	MATH 203	Calculus Textbook 10th ed.	Leibnitz, Albert Einstein, Euler
Advanced	CHEM 354	CHEM 103	Lab Coat, Erlenmeyer Flask	Walter White, Albert Einstein, Euler
Advanced	MRKT 420	MRKT 220	Get Rich Book	Patrick Bateman, Walter White, Jackie Chan

The project had asked for 8 students per course. If I had created manual students to assign at least 8 registered students throughout the system, it would have taken at least 3-4 hours since I would have to check for requirements for every course while simulating registeration. Instead, I used seeded random number generation to assign students to these courses. Here are the results:

MATH 106 Students:

Name	Age	Gender
name41	17	Female
name33	20	Female
name47	22	Female
name7	25	Female
name82	25	Male
name63	26	Female
name65	26	Female
name109	26	Female
name49	27	Female
name90	28	Male

MATH 107 Students:

Name	Age	Gender
name100	17	Male
name44	18	Male
name60	18	Male
name68	18	Male
name77	19	Female
name62	19	Male
name85	23	Female
name102	23	Male
name105	24	Female
name75	25	Female
name98	27	Male
name43	28	Female
name69	28	Female
name71	28	Female
name90	28	Male
name61	29	Female
name87	29	Female
name79	30	Female
name119	31	Female
name96	31	Male
name108	31	Male

CHEM 103 Students:

Name	Age	Gender
name4	18	Male
name2	21	Male
name16	22	Male
name15	26	Female
name31	27	Female
name111	30	Female
name26	30	Male
name95	31	Female

COMP 100 Students:

Name	Age	Gender
name70	17	Male
name107	18	Female
name60	18	Male
name45	19	Female
name88	20	Male
name30	21	Male
name54	21	Male
name23	24	Female
name99	24	Female
name78	24	Male
name82	25	Male
name28	27	Male
name6	28	Male
name90	28	Male
name103	31	Female

CHEM 354 Students:

Name	Age	Gender
name101	18	Female
name44	18	Male
name77	19	Female
name50	20	Male
name39	21	Female
name61	29	Female
name104	29	Male
name79	30	Female
name93	30	Female
name94	31	Male

MRKT 220 Students:

Name	Age	Gender
name81	18	Female
name107	18	Female
name17	20	Female
name97	23	Female
name58	27	Male
name72	27	Male
name73	28	Female
name27	29	Female
name115	29	Female
name24	29	Male
name76	29	Male
name37	30	Female
name64	30	Male
name66	30	Male
name119	31	Female

MRKT 420 Students:

Name	Age	Gender
name68	18	Male
name62	19	Male
name40	22	Male
name56	22	Male
name5	23	Female
name51	23	Female
name78	24	Male
name114	30	Male
name42	31	Male

MATH 203 Students:

name28	27	Male
name32	28	Male
name14	29	Male
name24	29	Male
name76	29	Male
name111	30	Female
name19	31	Female
name35	31	Female
name74	31	Male
name83	25	Female
name106	25	Male

MATH 204 Students:

Name	Age	Gender
name81	18	Female
name4	18	Male
name117	19	Female
name50	20	Male
name56	22	Male
name57	24	Female
name58	27	Male
name59	30	Female
name8	30	Male
name94	31	Male

UNIV 199 Students:

Name	Age	Gender
name60	18	Male
name39	21	Female
name55	22	Female
name10	24	Male
name6	28	Male
name12	28	Male
name14	29	Male
name24	29	Male
name93	30	Female
name34	31	Male

PHYS 101 Students:

Name	Age	Gender
name25	18	Female
name45	19	Female
name110	21	Male
name113	22	Female
name51	23	Female
name97	23	Female
name67	29	Female
name21	30	Female
name29	30	Female
name79	30	Female
name8	30	Male
name64	30	Male

PHYS 102 Students:

Name	Age	Gender
name41	17	Female
name70	17	Male
name92	17	Male
name3	20	Female
name33	20	Female
name88	20	Male
name47	22	Female
name99	24	Female
name7	25	Female
name83	25	Female
name106	25	Male
name63	26	Female
name1	27	Female
name69	28	Female
name71	28	Female
name32	28	Male
name38	28	Male
name59	30	Female

4. Sign Up/Login Guide

The program welcomes the user with two options: Login and Sign In.

Signing Up:

- To sign up, click on sign up and select the user type:

Image-1 Welcome Panel

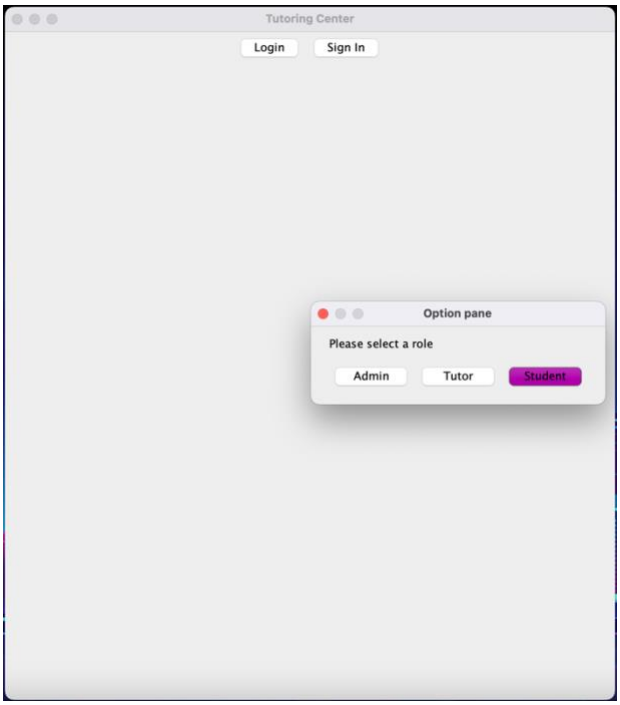

Image-2 Prompt Appears After Clicking Sign In

- **As an Admin:**
  - Simply fill the username and password fields and click register.

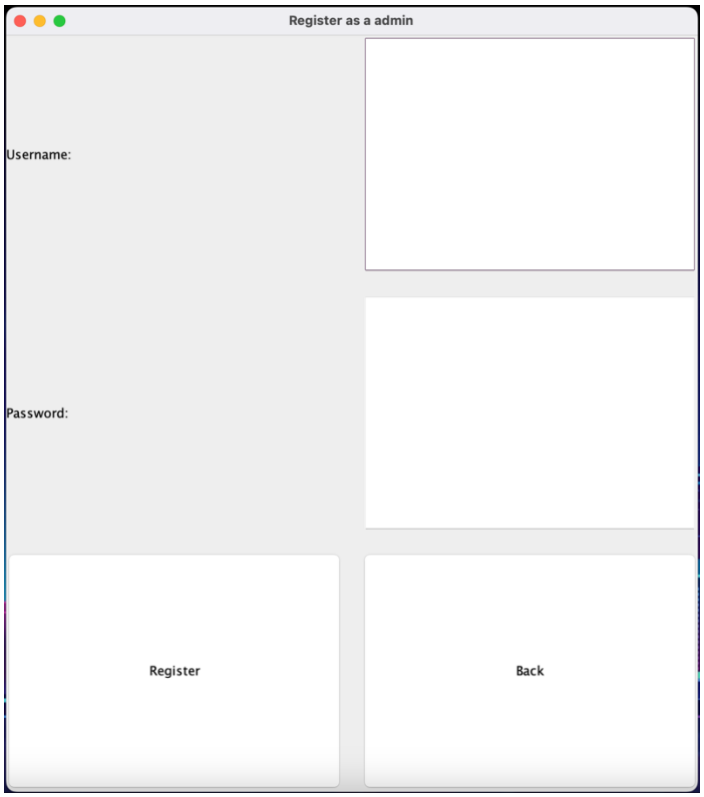

Image-3 Admin Registration Panel

- **As a Tutor:**
    - Fill out the username and password as you wish (You cannot have the same username with an existing tutor).
    - ID is generated from order automatically. The first tutor to sign in has the id 0001, the second 0002 and so on.
    - To select a portrait, click choose file button.
    - If you are an A level tutor, check the box.
    - Your cut percentage is randomly generated according to the guidelines and your tutor type when you click “Register as Tutor”.

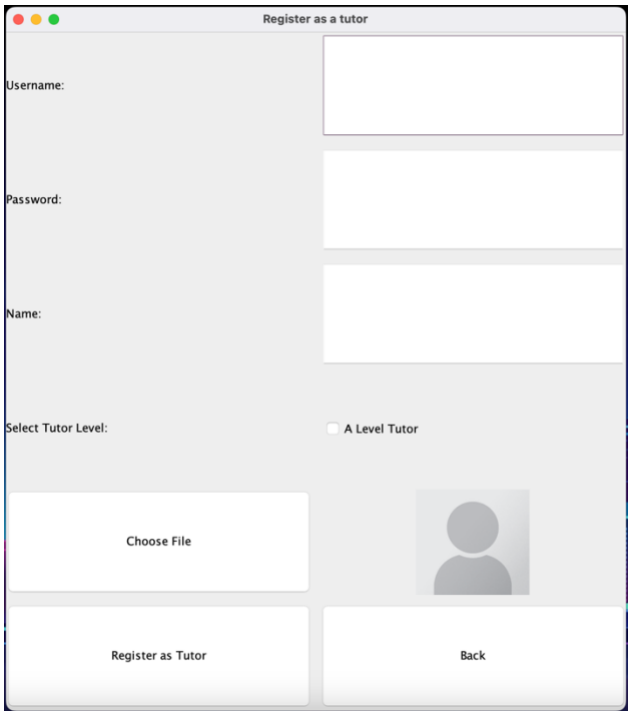

Image 4 After Clicking on "Choose File"

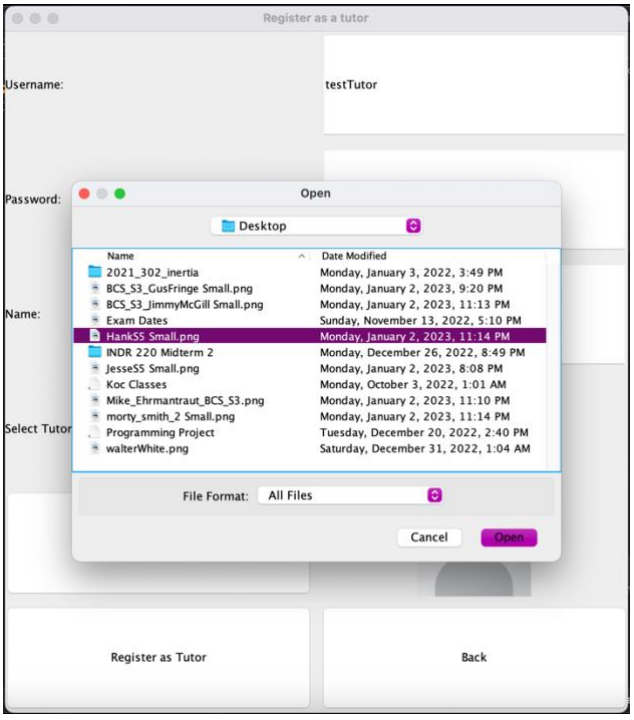

Image 5 Tutor Registration Panel

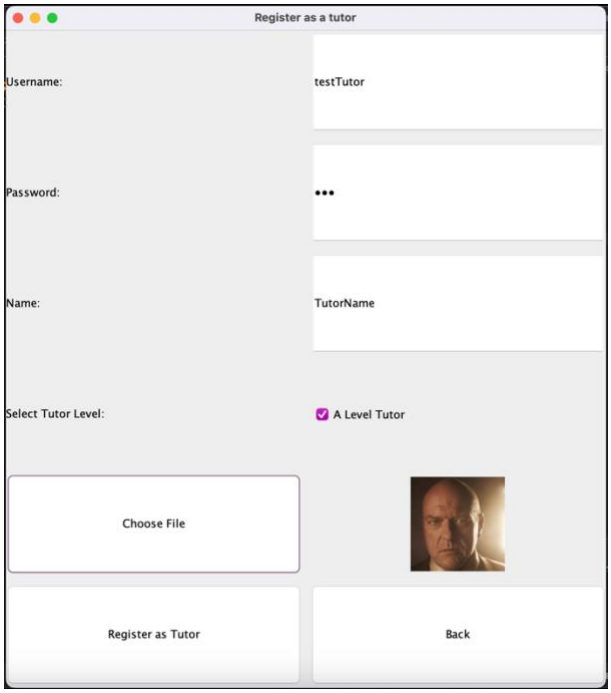

Image 6 Image Has Been Set

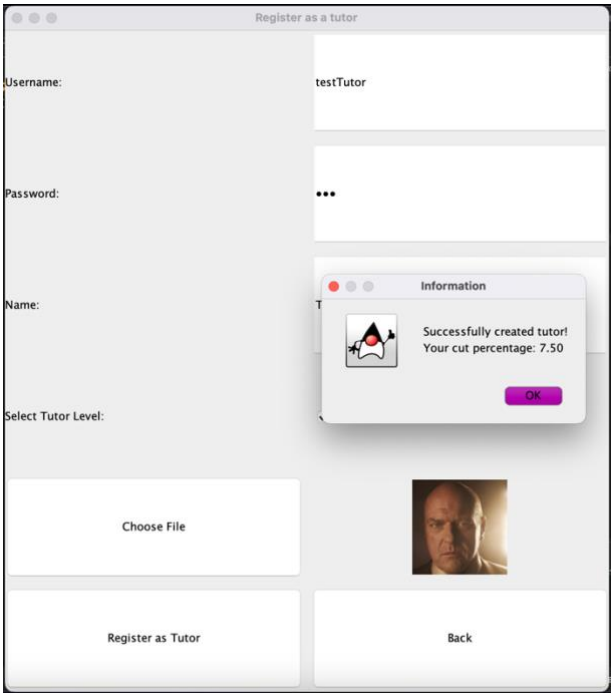

Image 7 Successful Tutor Registration

- **As a Student:**
    - Fill out the username and password fields freely (You cannot have the same username with an existing student).
    - Your TCKN must entirely consist of 11 digits. Otherwise, you will not be able to register as a student.
    - Enter your balance in digits as large as you'd like. This acts like a money depositing action to the student's wallet.
    - If you are a male, type Male in the gender field. If you are a female, type Female in the gender field. (The gender is only important for sorting the students for the admin)
    - After filling out the information, click "Register as Student"

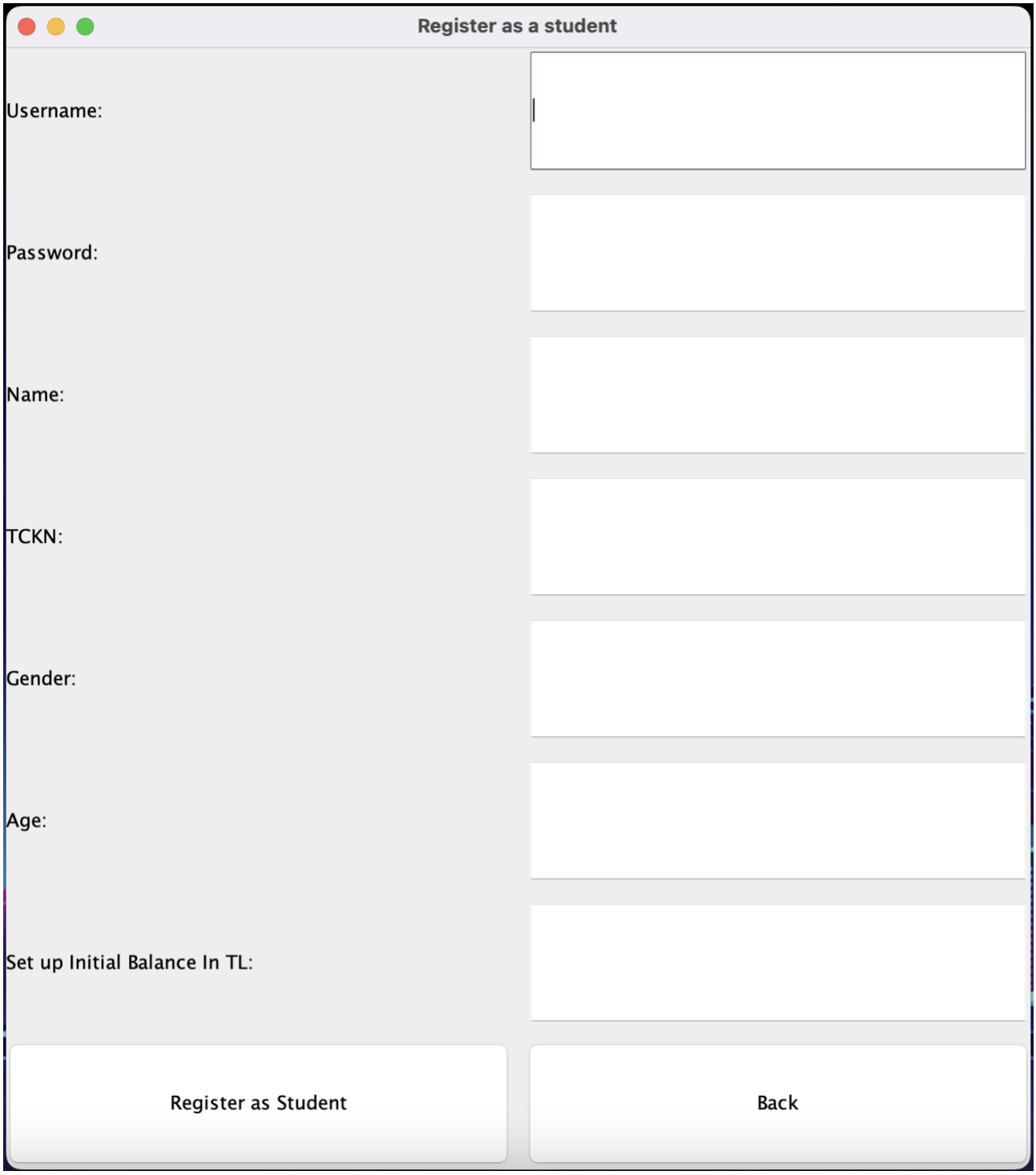

Image 8 Student Registration Panel

Logging In:

- To log in, click on Login in welcome panel.
- Click on the dropdown list and select the type you want to login as:

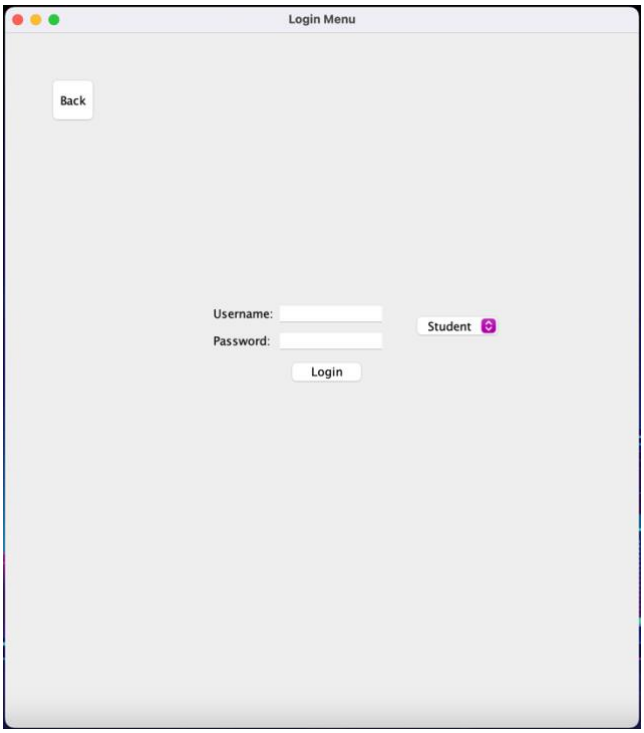

Image 9 Login Panel

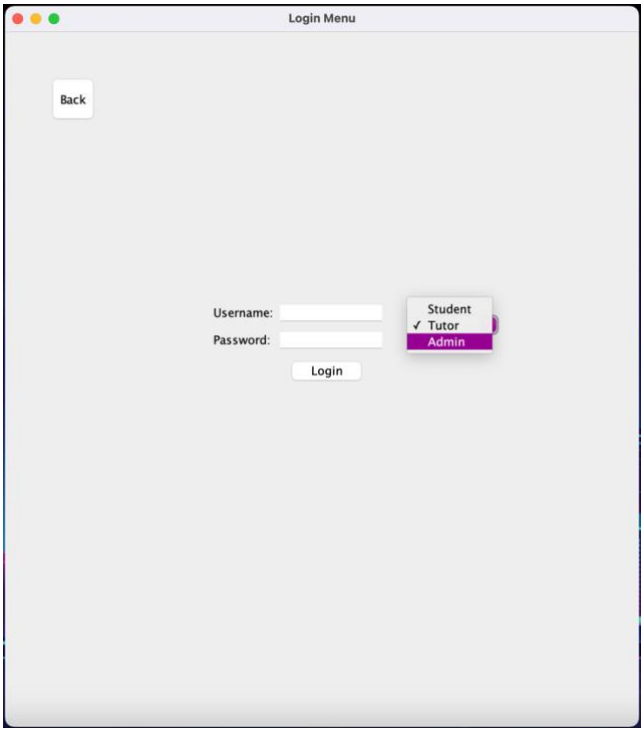

Image 10 Select Desired User Type

- After selecting the user's type, just enter your information.
- You have successfully logged in to the system!

5. Student's Guide

- The student panel looks like this:

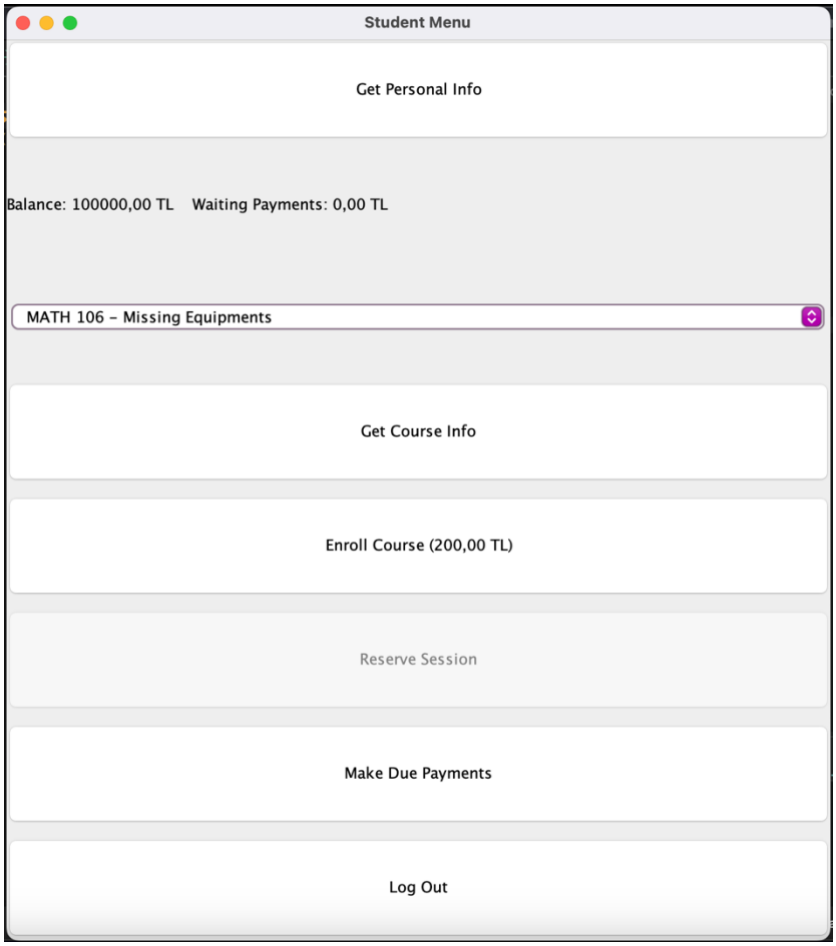

Image 11 Student Panel

- Now, starting from top to bottom, every part of this panel will be explained.

- **Personal Info Panel:**
    - This panel is accessed by clicking on the “Get Personal Info” button.

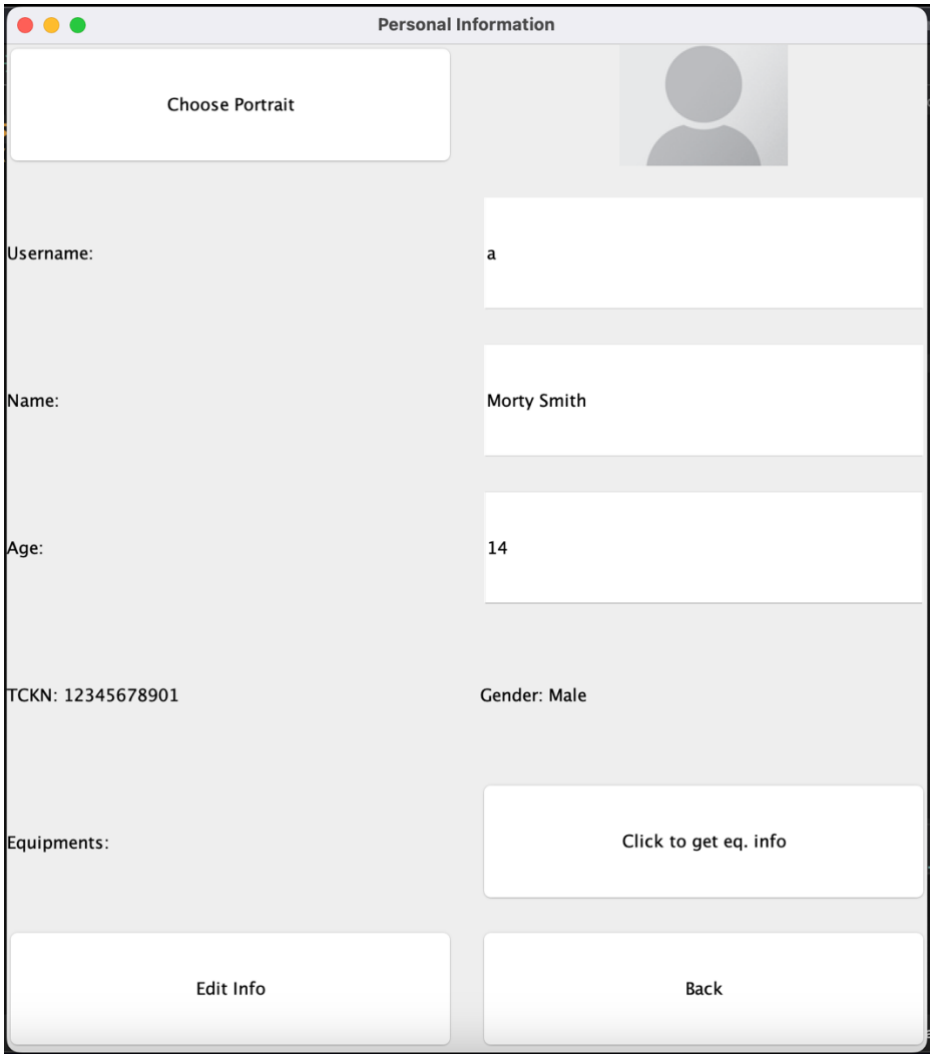

Image 12 Student's Personal Information Panel

- To select a profile picture, click on “Choose Portrait” button
- You can modify your information by clicking on “Edit Info” button to make your information editable.
- Clicking on the button for the second time saves the newly entered information.

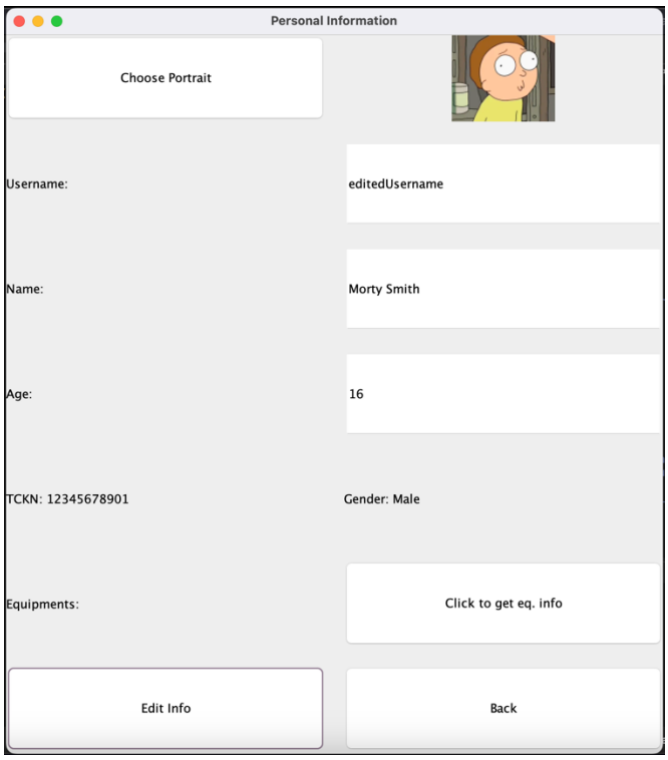

Image 13 Personal Info Panel After Doing the Previous Two Steps

- Clicking on “Click to get eq. info” gives the user information about their equipment. This is the student’s equipment info after enrolling to MATH 106 and COMP 100.

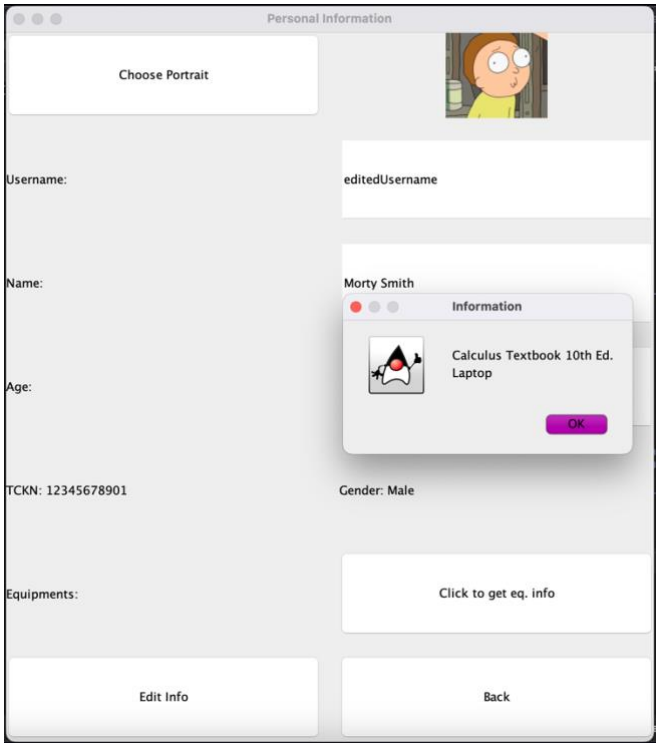

Image 14 Equipment Info Message

- **Balance Label and Making Due Payments:**
  - "Balance" label shows the amount of money the student has while "Waiting Payments" label shows how much money the student needs to pay to the system.
  - Waiting payments will increase as the student buys equipment (equipment's price is added) and/or when the tutor completes a session (session price is added) regarding the student.

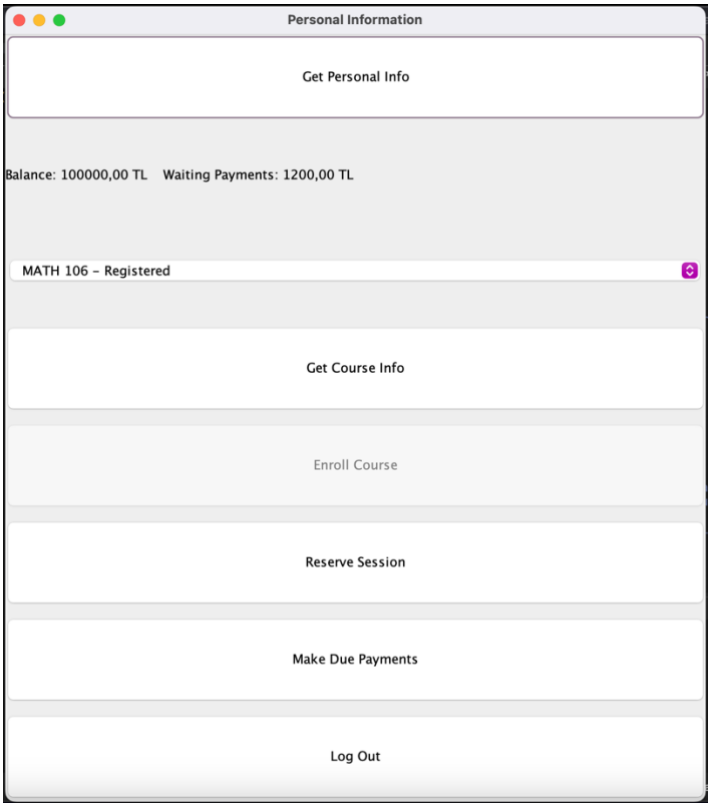

Image 15 Student Needs to Pay 1200TL due to New Equipments

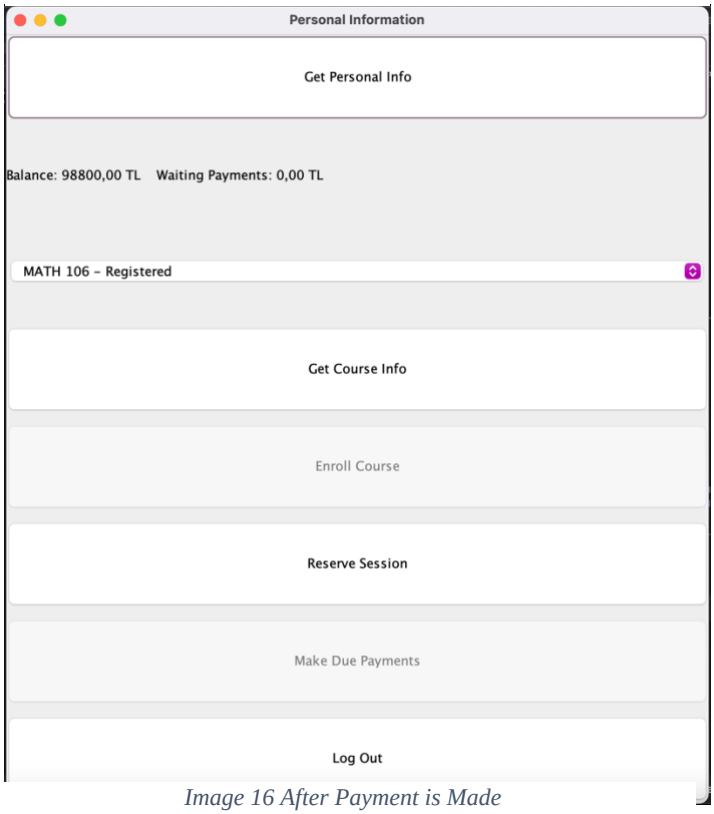

Image 16 After Payment is Made

- **Getting Course Info:**
  - To get info about the course currently selected in the dropdown list, click on “Get Course Info” button.

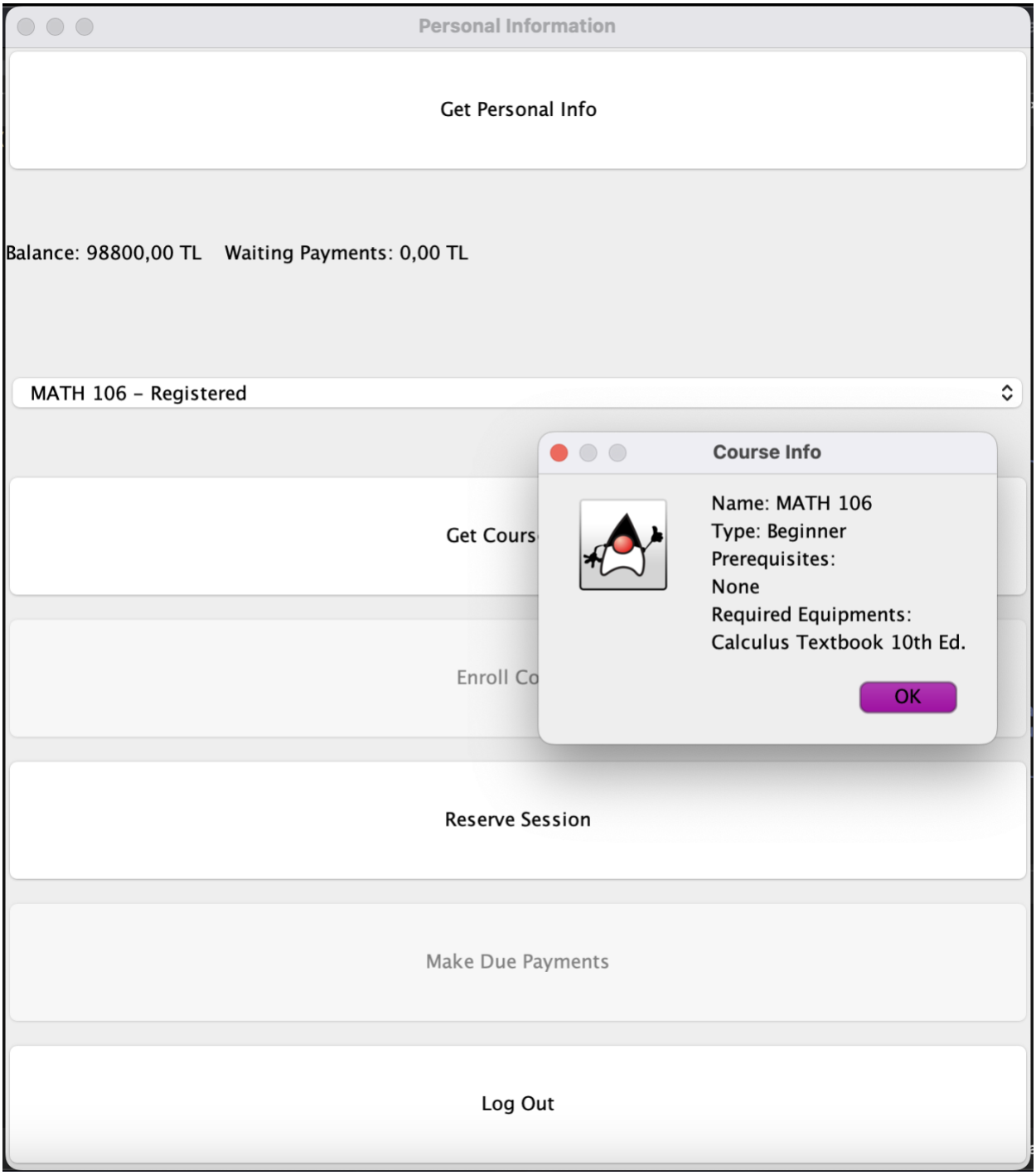

Image 17 Course Information

- **Enrolling A Course:**
  - If a course is available or you have missing equipment and have enough money to buy that equipment, you can register to the course.

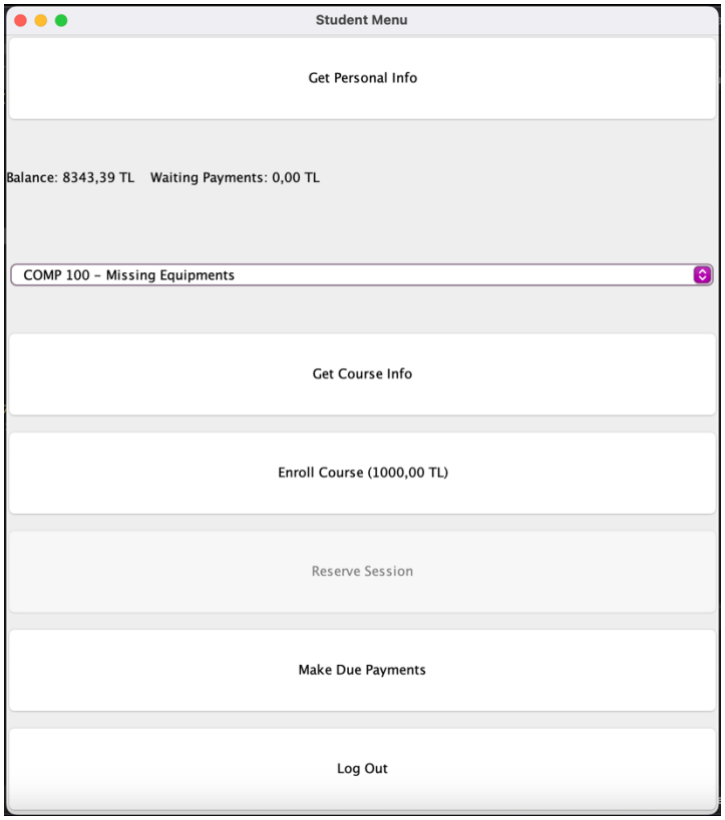

Image 18 Student Can Reserve the Course If They Pay 1000TL for the Missing Equipment

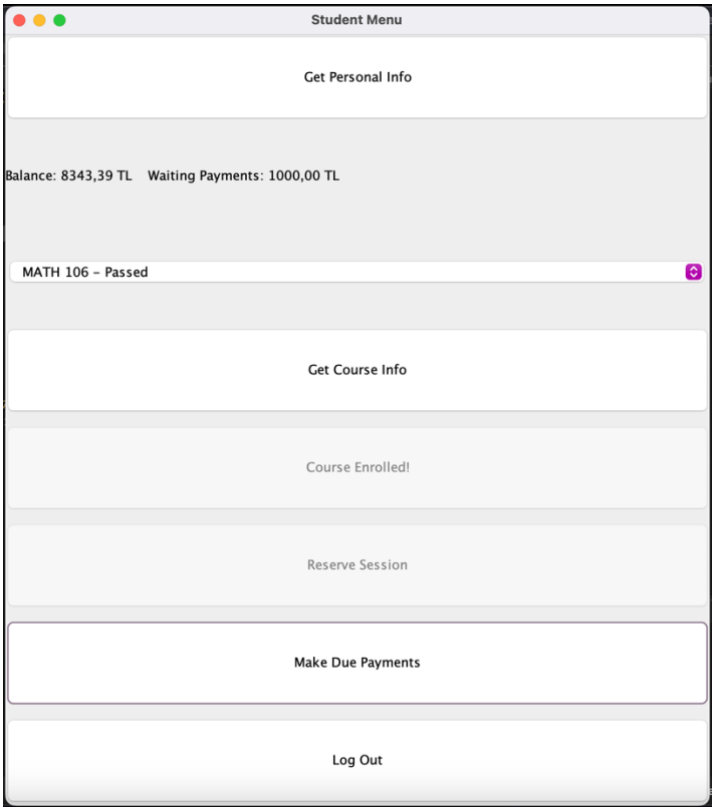

Image 19 Student Has Registered to the Course

- **Reserving a Session:**
  - After clicking on “Reserve Session” button, this panel will appear.
  - This panel will only show sessions for the selected course on the dropdown list.

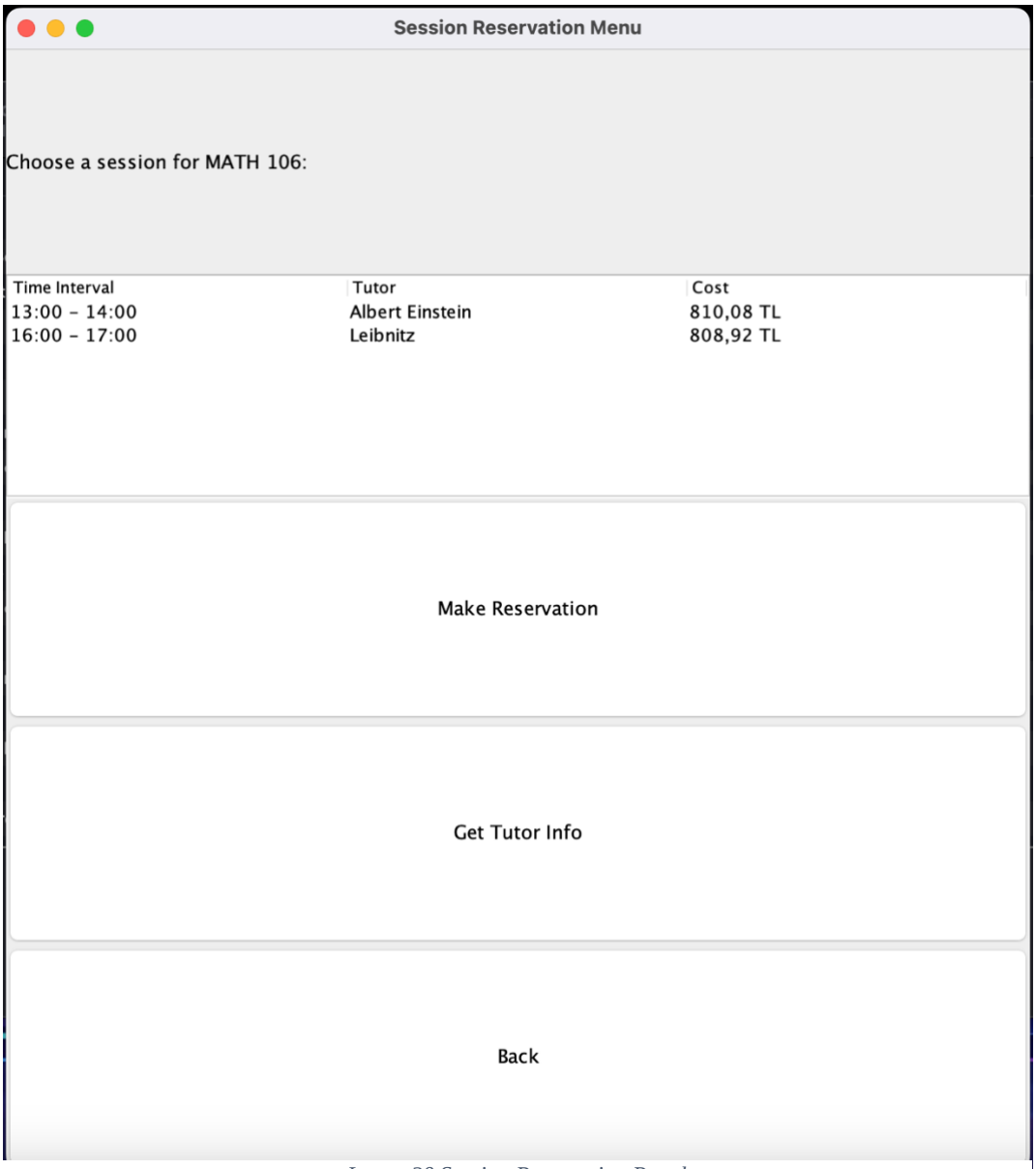

Image 20 Session Reservation Panel

  - Selecting a row and clicking on “Make Reservation” will make the reservation.
  - Info about the selected session’s tutor can be accessed by clicking on “Get Tutor Info”.

6. Tutor's Guide

- This is how the Tutor Panel looks.

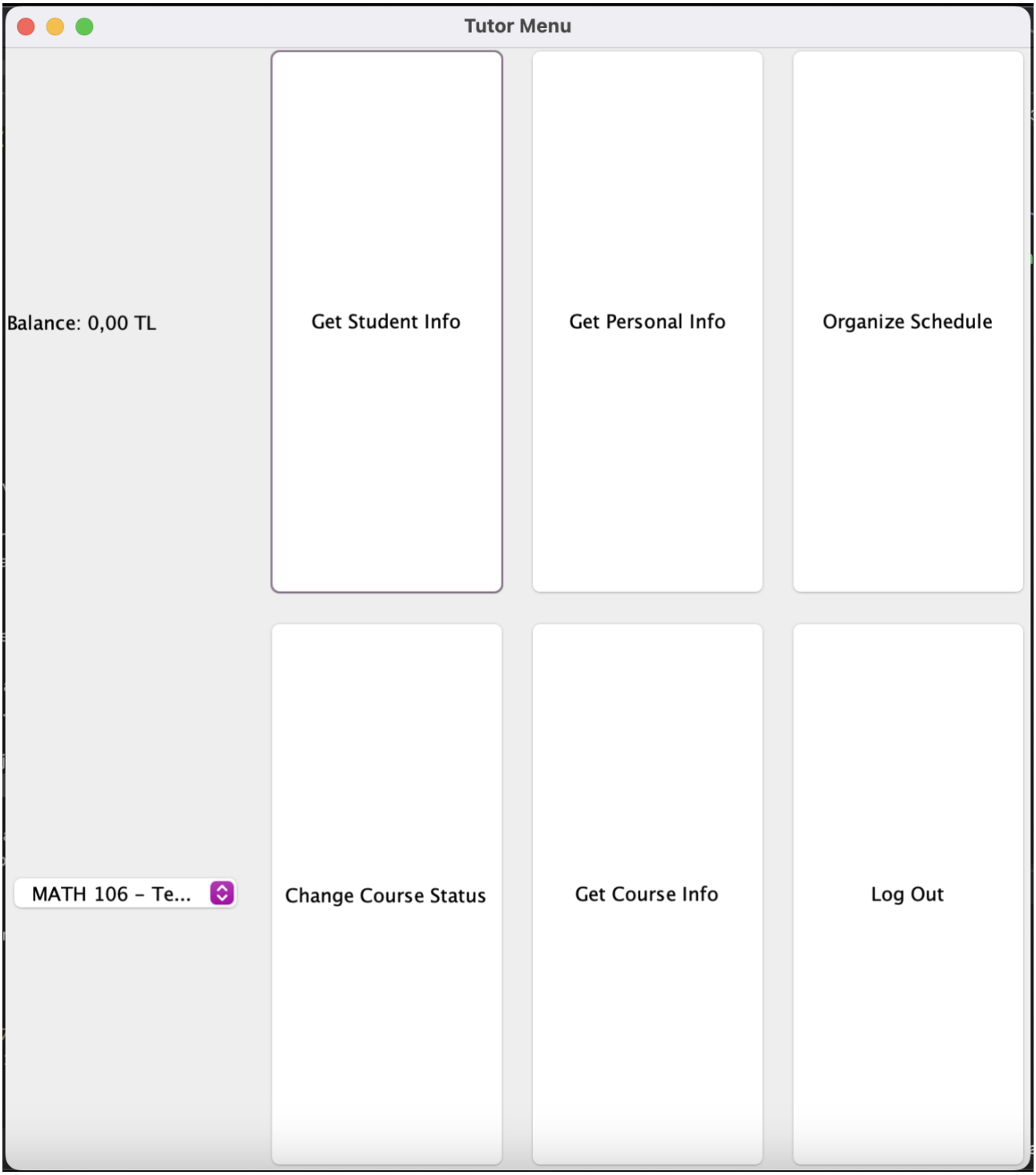

Image 21 Tutor Panel

- **Balance:**
  - Balance label shows the tutors money. The balance is refreshed *only* when an admin "finalizes payments" (look up finalizing payments in Admin's guide).

- **Student Info:**
  - To acquire about students' info that are taking at least a single course that is being taught by the user tutor, click on "Get Student Info".

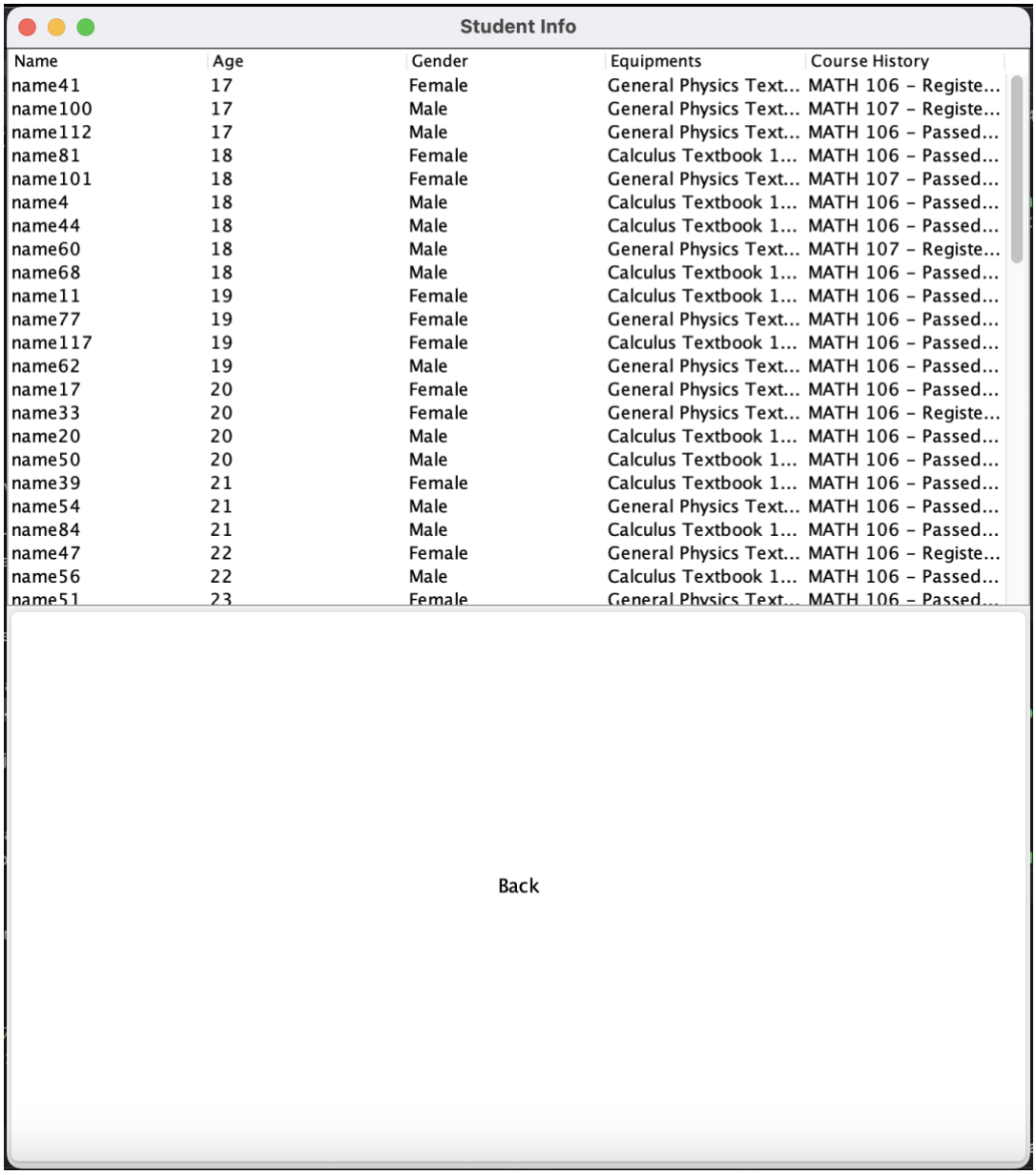

Image 22 Student Info Page of Tutor "Euler"

  - In this example, since Euler is tutoring MATH 106, MATH 107, CHEM 354, MATH 203, and MATH 204, he can see all the students that are registered to at least one of these courses.

- **Personal Info:**
  - Works the same as Student's personal info panel with the two differences being that there is no equipment info and ID cannot be set to a non-integer.

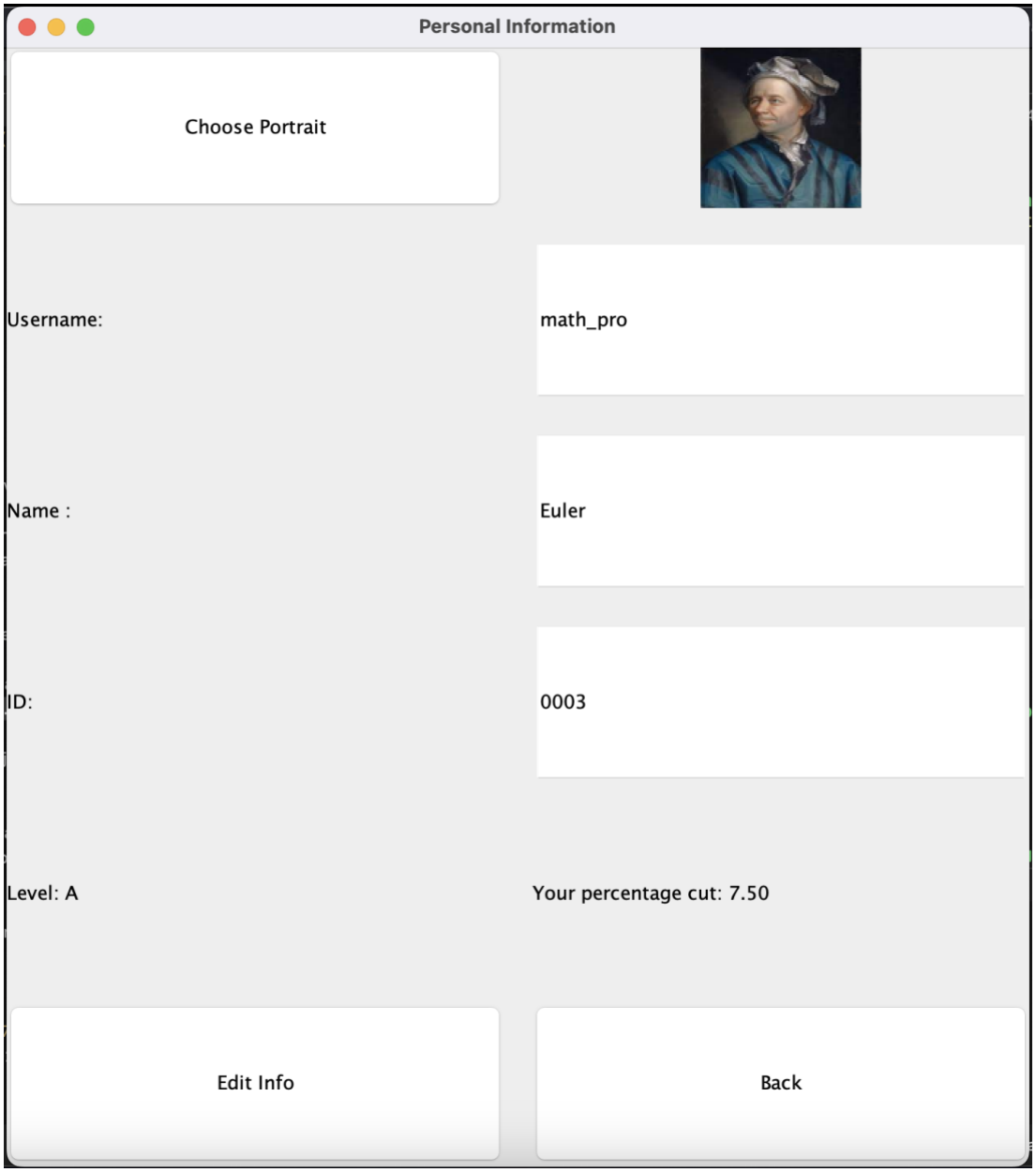

Image 23 Tutor's Personal Info Panel

- **Organizing Schedule:**
  - You can see your created sessions in this panel.

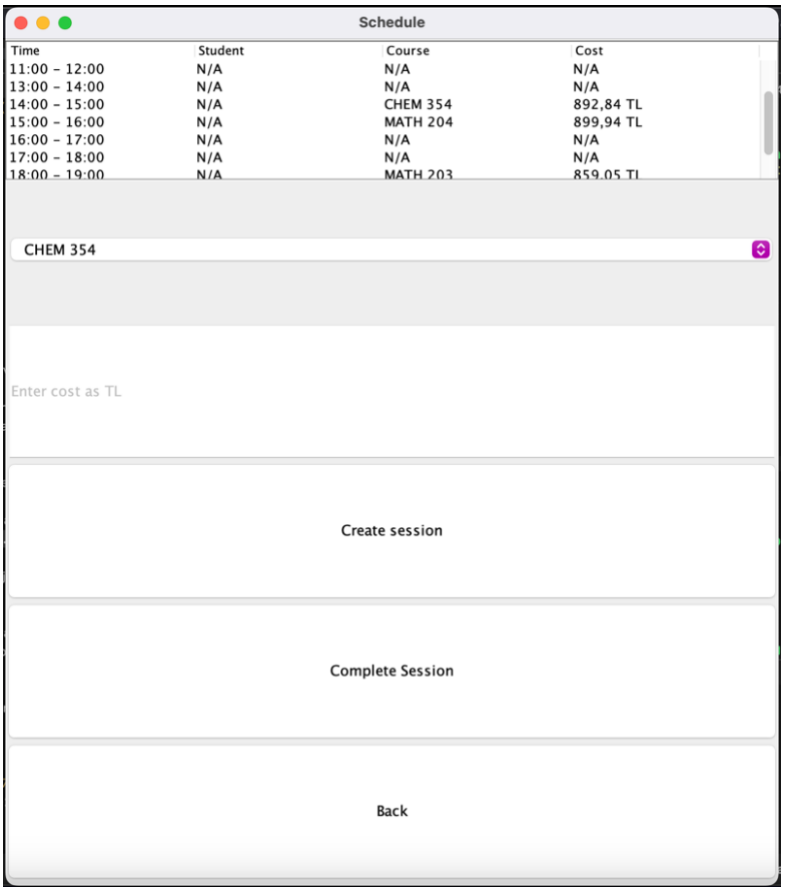

Image 24 Schedule Organizing Panel

  - You can also create and complete sessions.
  - To create a session, select an empty session and specify the cost.

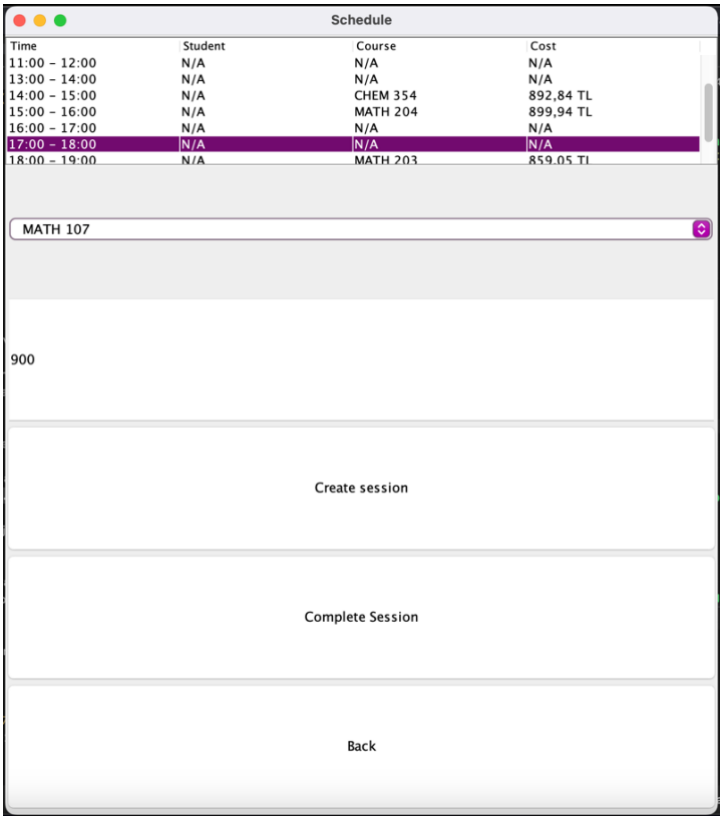

Image 25 Creating a Schedule

- Click on “Create Session” to create the session.

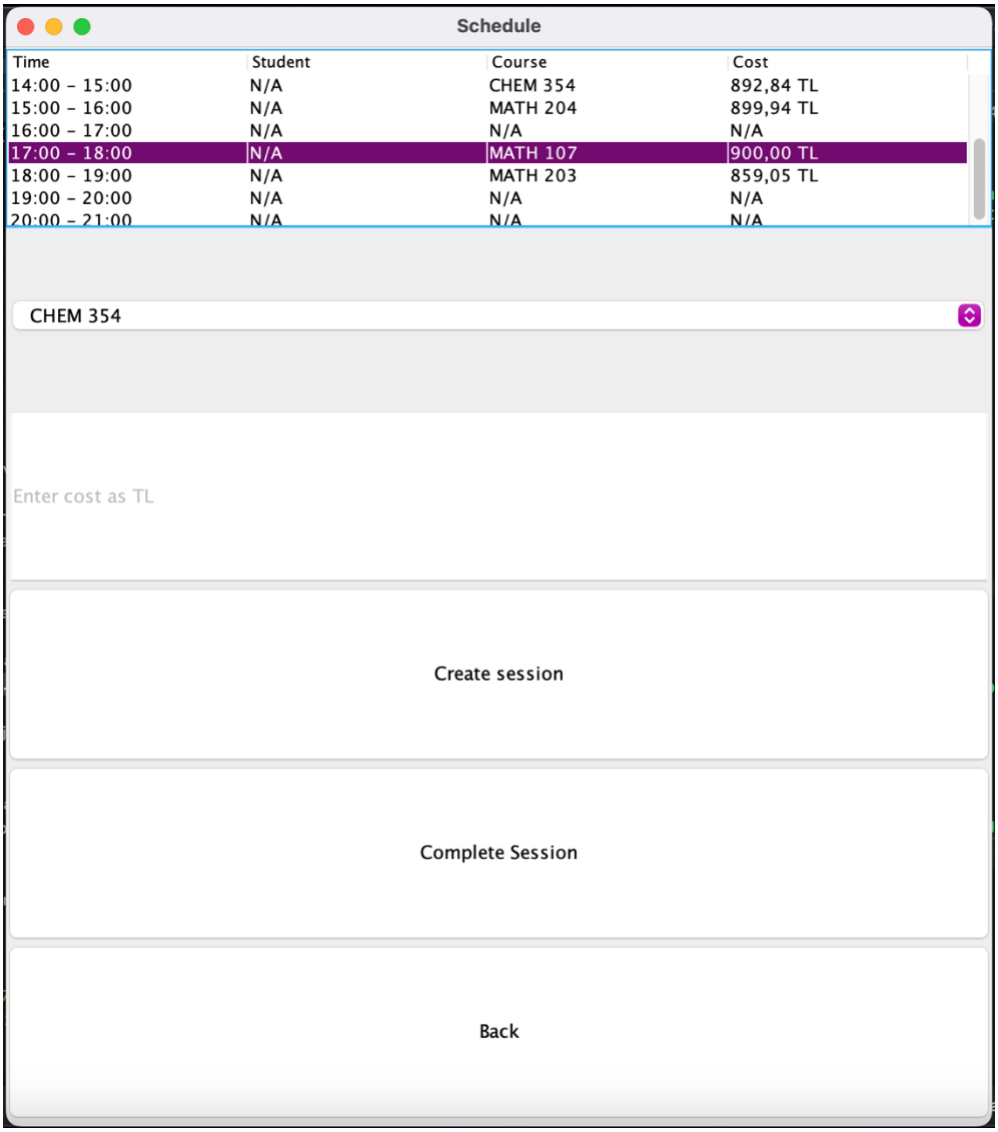

Image 26 MATH 107 Session Has Been Created

- To complete a session, select a session with a student and click on “Complete Session”
- You will be asked if the student has passed or failed the course. After making your choice, you have successfully completed a session.

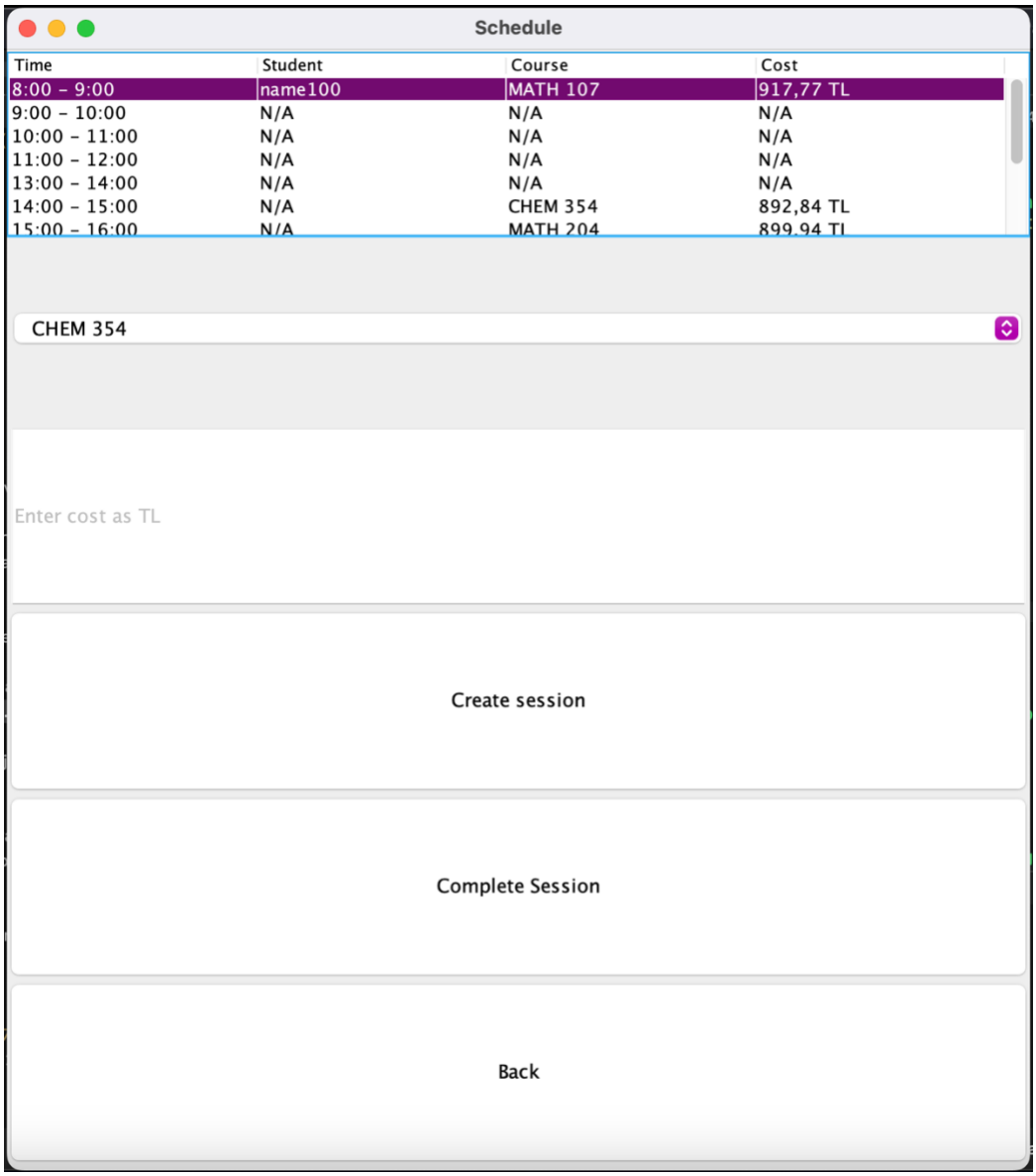

Image 27 After clicking "Complete Session", the Session Will End

- **Course Information and Status:**
  - To get your status on a given course and get the course info, use the lower half of the panel.
  - The dropdown list of courses gives you information on whether you're teaching that course or not.
  - To remove the selected course from your taught courses list or add the course to the taught courses, click on "Change Course Status". If you are currently teaching the course, it removes it from the taught courses, and if you aren't teaching the course

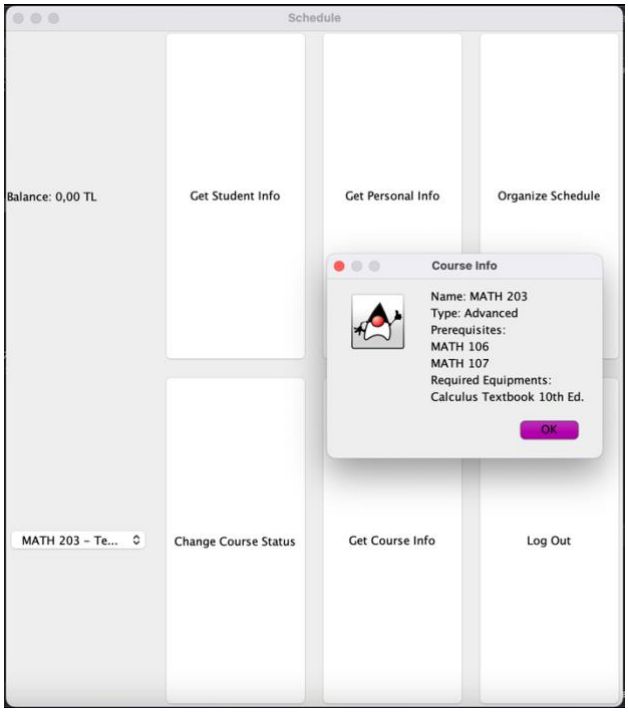

Image 28 Using Get Course Info Button

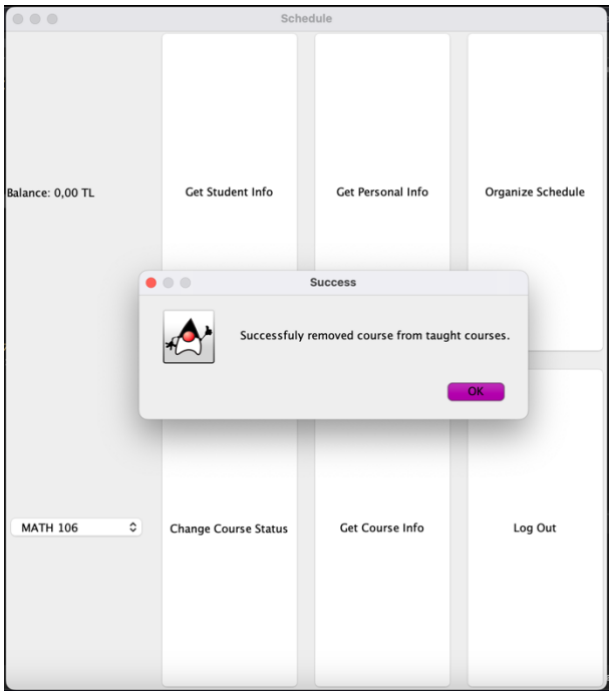

Image 29 Using Change Course Status Button

7. Administrator's Guide

- This is the admin panel.

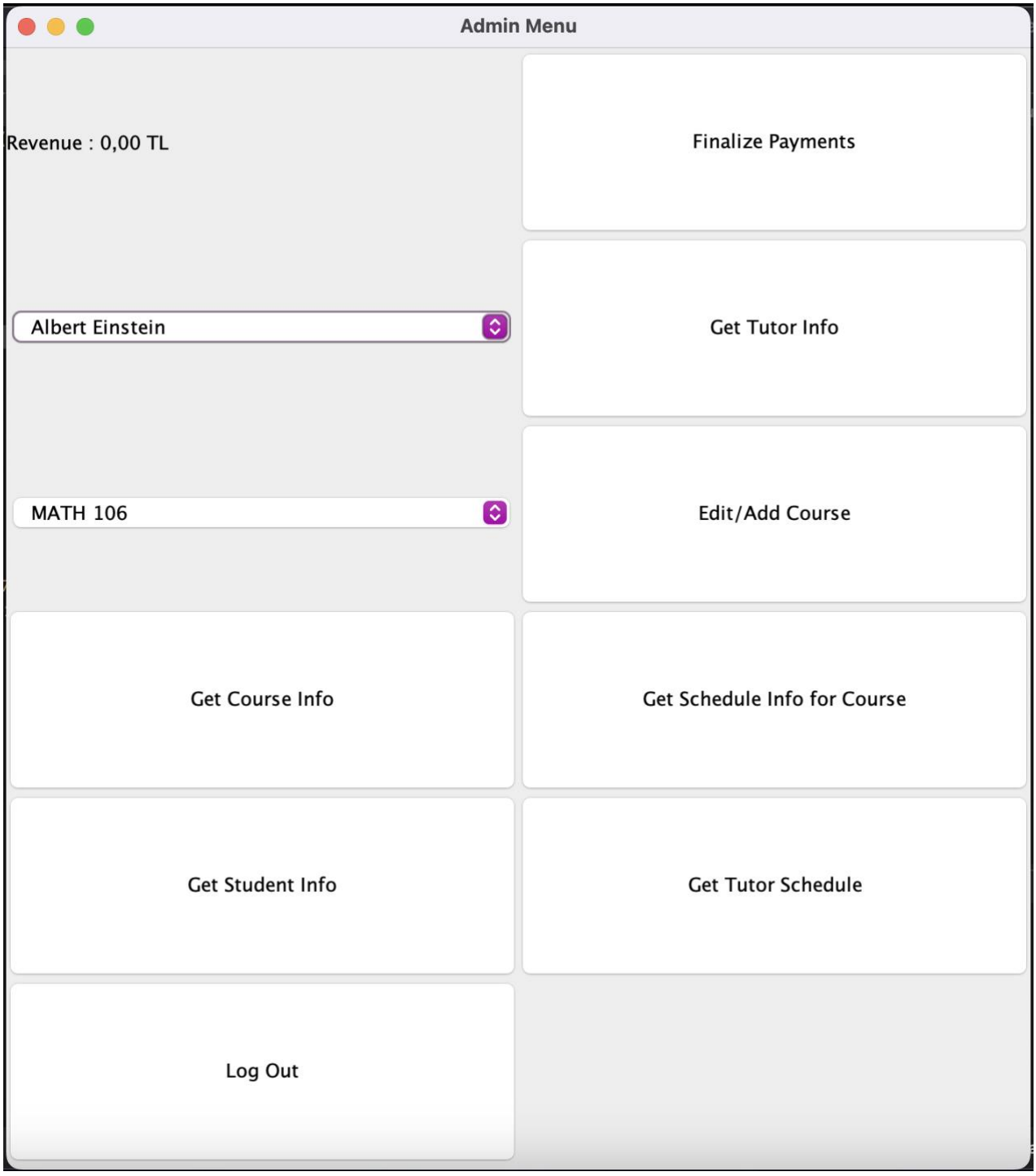

Image 30 Admin Menu

- **Revenue and Finalizing Payments:**
  - After a student buys an equipment to register a course, or a tutor completes a session, it is added to a queue which waits for an admin to finalize transactions and add revenue to the system. Let's say a student (username0) bought a 1000TL laptop with a 18% cut rate for COMP100 then arranged and completed a session with Bruce Wayne for 831,65TL. The student will have 1831,65TL in payments due. Tutor will not yet have their cut added to their balance.
  - When the admin clicks on "Finalize Payments", the tutor will have the money added to their balance. The revenue of the system will be refreshed.

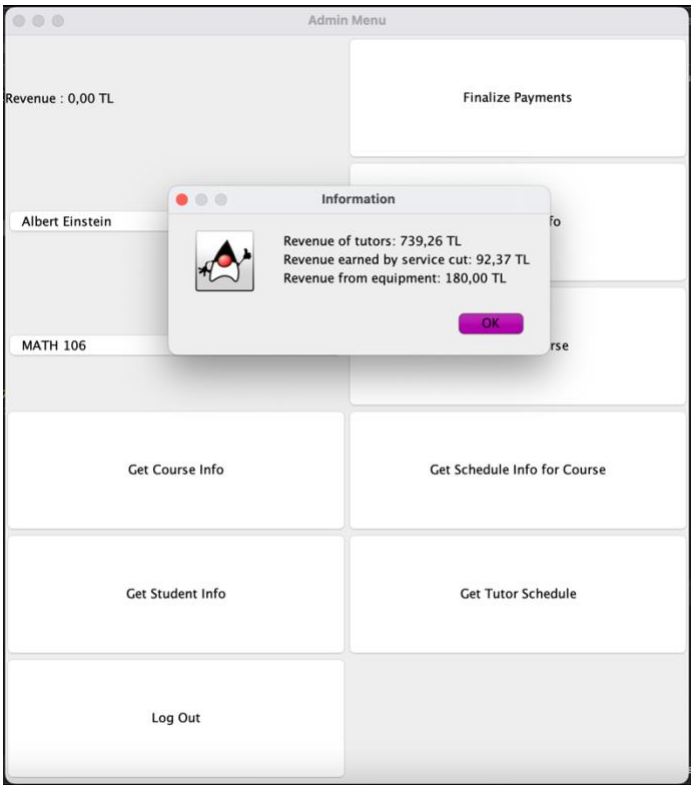

Image 31 Summary of the Transactions Since the Last Time It Has Been Used

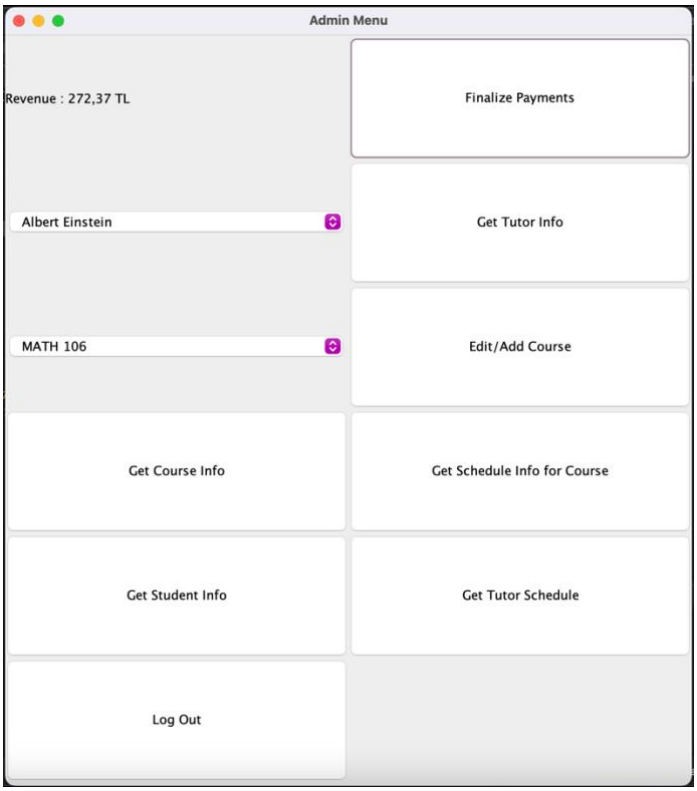

Image 32 Appropriately Refreshed Revenue

- **Getting Info About Students, Courses, and Tutors:**
  - To get info about the selected tutor, click on “Get Tutor Info” button.
  - To get info about the selected course and how much revenue it has generated, click on “Get Course Info” button.
  - To get a schedule info for the selected course just like a student, click on “Get Schedule Info for Course” button.
  - To get the schedule of the selected tutor, click on “Get Tutor Schedule” button.
  - To get the info of students registered to the selected course, click on “Get Student Info” button.
- **Creating a New Course/Editing Course:**
  - To create a new course, click on “Edit/Add Course” button.

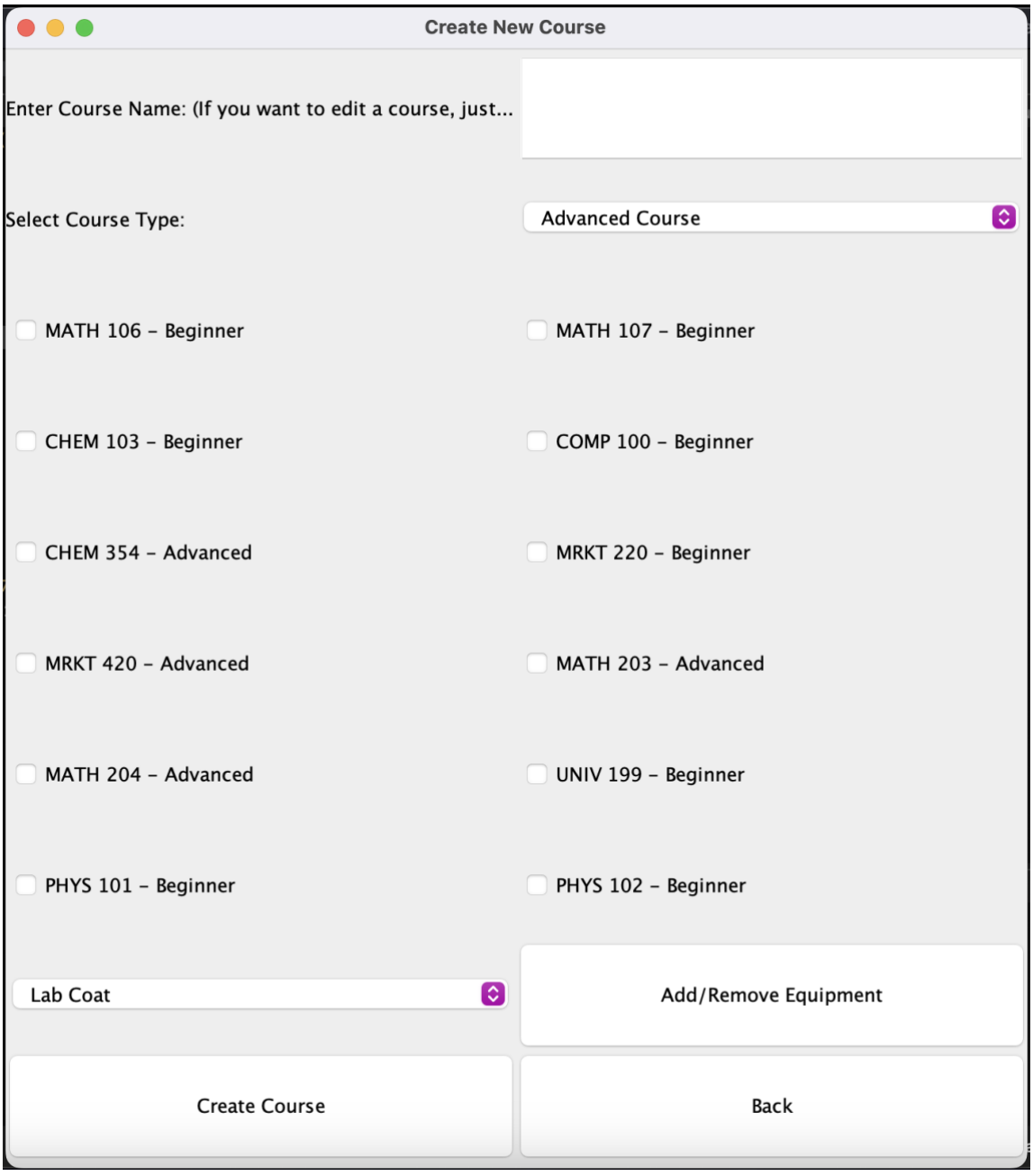

Image 33 Course Creation and Editing Panel

  - Here, you can create a course by selecting the prerequisites, the course type and required equipment.
  - To add a required equipment, select the equipment from the dropdown list and click on “Add/Remove Equipment” button.
  - To finalize creating a course, click on “Create Course”.

PART 2

PROJECT DESIGN

In this section, I will go over the classes I have used one by one and explain the relations between them.

TutoringCenterSystem:

- Stores all the data of the system in its fields.
- This class is a singleton, meaning it can only have a single instance. This makes it easy to avoid duplicate data and easy to retrieve this data from anywhere.[1]

User:

- User class is the superclass of Student, Admin and Tutor classes.
- It has username and password fields.
- User is an abstract class. This is designed that way because at no point can a user not be a Student, not an Admin and not a Tutor at the same time.

HasPersonalInfo:

- This interface allows its implementors to provide personal information, which can be used in the GUI to display their info.

Admin:

- This class extends User.
- An admin has no unique field from a User because it is enough to differentiate the admins using username and passwords.

Tutor:

- This class extends User.
- Tutor class is also an abstract class as a Tutor can only either be A level or B level.
- Tutor has the additional following fields:
    - Courses: Stores the courses the Tutor is teaching the as a list.
    - Schedule: A Schedule object unique to the Tutor.
    - ID as an int
    - Balance as a Money object
- Tutor implements the interface HasPersonalInfo.

ALevelTutor and BLevelTutor:

- These classes extend Tutor.
- These classes have no additional field from a Tutor.
- The reason these classes exist is because it makes it easy to classify Tutor levels using instanceof keyword.
- Another difference between them is that when their constructor is called, they are assigned a random cut percentage within the boundaries permitted for that.

Student:

- This class extends User.
- Stores all the data for the Student such as name, Passed, Registered and Failed courses.
- Tutor implements the interface HasPersonalInfo.

Course:

- This is an abstract class since a Course can only be an Advanced or a Beginner Course.
- Has the following fields:
    - Name of the course
    - Prerequisite courses of the course
    - Required equipment of the course

AdvancedCourse and BeginnerCourse:

- These classes extend Course.
- These classes have no unique field from Course.
- The reason these classes exist is that it makes it very easy to classify the Course level.
- For example, it is easy to check whether an Advanced Course is attempted to be assigned as a prerequisite to a Beginner Course with these subclasses.

Equipment:

- This class has the following fields:
    - Price of the equipment as a Money object
    - Name of the equipment
    - A percentage (stored as a double from 0 to 1) that stores how much of the equipment's revenue goes to the system.

Schedule:

- This class has an instance unique to every tutor.
- It stores all the session information for all the hours.

Session:

- This class has the following fields:
    - The hour of the session
    - The tutor of the session
    - The student of the session
    - The course of the session
    - The price of the session as a Money object
- This class allows for easy data storage of schedule hour information.

Money:

- This class is the cornerstone of every transaction happening in the code.
- Has a single field: amountInKurus.
- This field allows the system to make transactions that do not encounter floating point errors.
- Has methods that allow Money objects to be added to and multiplied with each other.

TutoringCenterUI:

- This class extends JFrame.
- This class is a singleton, meaning there can only be a single instance of it.[1]
- It communicates with UserInterfaceDataHelper to show new JPanels.

UserInterfaceDataHelper:

- This class allows the communication between TutoringCenterUI and all the other JPanel subclasses: AdminPanel, AdminRegisterPanel, CourseCreationEditPanel, LoginPanel, OrganizeSchedulePanel, PersonalInfoPanel, ReserveSessionPanel, StudentInfoTablePanel, StudentPanel, StudentRegisterPanel, TutorRegisterPanel, and WelcomePanel.

BackButton:

- This class extends JButton.
- Has an actionlistener that calls the goBack method of UserInterfaceDataHelper which tells TutoringCenterUI to go to the previous panel.

FileChooserButton:

- This class extends JButton.
- Allows for the selection of an image and storing it in a field inside Tutor or Student depending on the arguments provided.

Helper Classes:

- There are multiple helper classes in this project: CourseHelper, ScheduleHelper, EquipmentHelper, UserInterfaceDataHelper, and UserHelper.
- All of these classes only contain public static methods, meaning that I could have just stored all of them in a single class.
- The reason I separated them was because some methods had too many parameters for me to put them in a class that it took its objects as arguments. To reduce the chance of overlooking things (such as when adding a tutor to a course, the course should add the tutor as well) I settled for these helper classes that I believed to have classified effectively enough for me to find whatever I was looking for more easily.

Validators and Exception Classes:

- To prevent unwanted bugs from occurring by the user, I wrote some public static methods in Validator class to check for them before they happen. This allowed me to call methods that would otherwise be very likely to have errors, work completely fine. The custom exception classes I wrote helped me to identify what was wrong with the code I was writing as well. It also helped me create accurate error messages in case the user attempted to do something they are not supposed to do.

References

1) https://www.geeksforgeeks.org/singleton-class-java/

Other than using this site to learn about how to construct a class with a single instance, I used Oracle's Java GUI documentation and lecture notes to learn about the topics themselves.