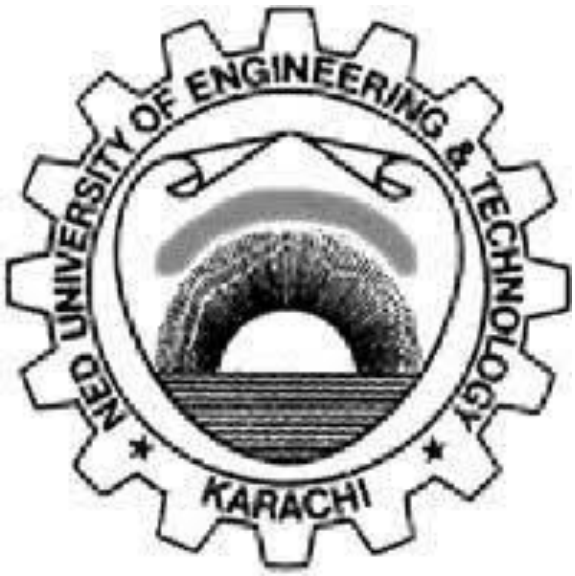
Complex Engineering Problem

OBJECT ORIENTED PROGRAMMING
CS-116| FE BATCH 2020, SPRING SEMESTER 2021 | TERM PROJECT

DEPARTMENT OF COMPUTER & INFORMATION SYSTEMS ENGINEERING

BACHELORS IN COMPUTER SYSTEMS ENGINEERING



Team Members

Werdah Hashmi: CS-22

Hiba Khan: CS-18

Syed Aali: CS-53

Submitted To:

Dr. Maria Waqas and Miss Fauzia Yasir

Table of Contents

Problem Description

Term Project Title:

LIBRARY MANAGEMENT SYSTEM

Description:

In this Library Management System project, you can enter the record of new books and retrieve the details of books available in the library. The students can also issue the books and the records will be maintained. Only one book is issued to students. New book is not issued to students if they have not returned the last book.

Project Explanation and features:

A menu will be created for a user to select whether they are a student or a teacher. If the user is new to the library, they will have the option to create account with some basic information. After selection of role, the user will enter their username and password which will give them access to the library management system. If they logged in as a teacher then there will be access to different services like add, remove or update the books. Also, there is an access to see the list of all the books.

• If you choose to add books then you can easily add the book by entering the book id, book name and author name.
• You can also delete or update the books, just by selecting the respective options from the menu.

If you logged in as a student, then there will be access of different services like:
• Borrow a book
• Return a book
• List of books
• The history of books borrowed shall also be maintained and stored.

In addition to this, the program will also:
• Store and display the records of books that the library has
• Store and display the records of books that have been borrowed.

Thought Process for the Project

The plan was to have something simple but applicable at the same time, to complement that goal, it had to be a system, made by using Object Oriented Programming, for a library that included basic and some in-depth features a person would expect from a system being used in a library.

The thought process was simple, a book library was in mind, where a user (student) could make an account, login, keep track or search for books of his liking and at the same time an Admin (Person with higher authority in said library) could login, add books, see all books available in the library, see all borrowed books, delete books, update book information, search for specific books, see all students, search for specific students, and remove students from specific databases where the data of the logins made by users, books in presence, books borrowed etc. was stored.

Distinguishing Features

Used what we had learnt in object oriented programming in a very simple and concise manner, but if a list was to be made the distinguishing features would be;

1. SQLite for our databases.
2. While Loops for our main program.
3. Try and except so that our program doesn't break.
4. Inheritance from abstract classes.
5. A simple interface for the user.
6. Helping outputs for the user to understand.
7. Not exiting till the user specifically tells the program to.
8. Static Methods.
9. Polymorphism (Method Overriding).
10. Encapsulation.
11. Association in login class.
12. Docstrings for help.
13. Code reusability in regards to SQLite.

Flow of the Project

The code works in a simple straight forward way.
When the user runs the code they get a menu where they could choose to enter as an admin or a student and the option to exit the code.
The Admin username is **LibraryAdmin** and password is **Admin_123.**
Let's say the user chooses to login as an admin, they would get the options to;

1. Add Books:
   This option grants the admin to add book information to the database.

2. Show all books available in the library:
   This lists all the books available in the library in a tabular form.
   Please note a sample data is already provided in the program. You can delete it, or update it, as per your choice. New data for books can always be added.

3. Show all borrowed books:
   This lists all the books currently being borrowed by the students, with the student username.

4. Delete Books:
   This allows the user to delete the books if needed from the database.

5. Update Book Information:
   This allows the user to change/correct a books id, name etc.

6. Search Book:
   This allows the user to search a book by its id.

7. Show all students:
   This lists all the accounts the students have made.

8. Search Student:
   This searches the students according to their email address.

9. Delete Student:
   This allows the admin to delete any accounts that he might want to, by entering their username.

10. Log out

The options are self-explanatory but with every choice the database simultaneously adds and or deletes the values in question.
If the user logs out and then a different user chooses to login as a student, they would get the options to;

1. Login:
   Allowing an already created user account to login.

2. New Account:
   Giving the option to make a new one.

If the user doesn't have an account, they get the option to make a new one by entering the following information;

1. First name

2. Last name

3. Email address

4. Username

5. Password

If the user logins with their account, they get the options to:

1. Show all books available in the library:
   Lists all available books in a tabular form,

2. Borrow a Book:
   Allows them to borrow a book by its Book ID.

3. Return a Book:
   Allows students to return books they have borrowed.

4. History of borrowed books:
   Gives the history of borrowed books.

5. Update Self Information:
   Allows user to change/correct everything but their username.

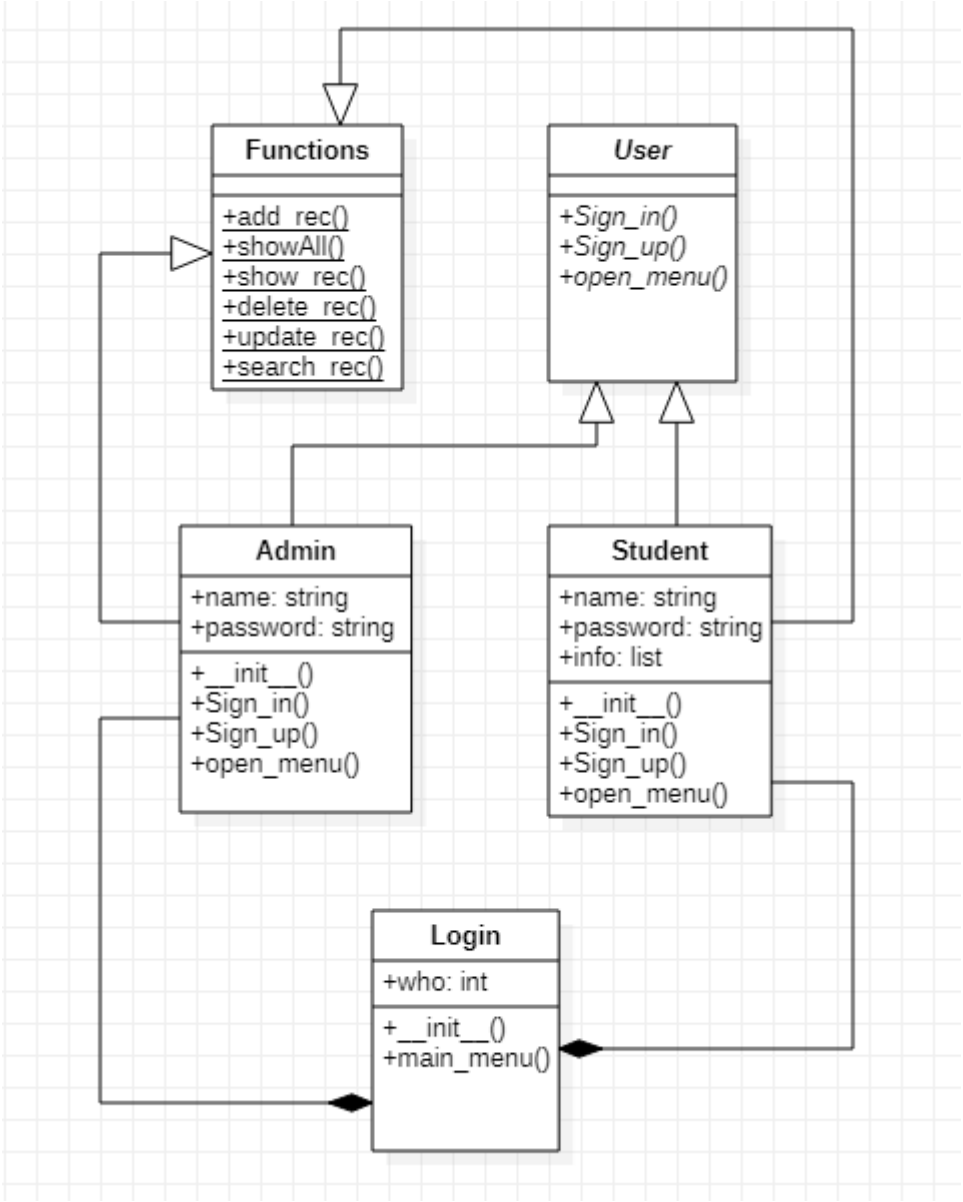
6. Log out.

Again all the selections made through the options subsequently affects the database which refreshes depending on the choices the user makes.

Now the user can log out and the options are given if he wants to go back to the menu or exit the whole program.

If the user chooses to exit the program, they are greeted with a good bye.

Class Diagram:



Most Challenging Part

The first challenge was figuring out where to start the code. The whole idea was sorted out but when it came to implementations hurdles were faced one of them being unable to start the code. All the ideas were flooding in simultaneously and organizing them was a little difficult. Many structures were made and then destroyed, and then made again, until we were satisfied with the implementation.

Another challenge was to store the data and filing was getting extremely boring.
We wanted to explore further on data handling, so we decided to go for SQLite3.
Although it was well explained on the internet, but obviously, some difficulty was faced to implement the built in queries by modifying them to fit to our needs. Hence, at some places, we have even given our own implementation of functions, instead of using SQLite3 queries.

F strings were used and functions were made in order to exhibit code reusability. We wanted to avoid redundancy, as much as possible. Try and except had to be used, along with while loops, to make sure the program wouldn't break on every input which was a bit tricky to implement, as to where should the code, continue and break, statements be placed.

New Things Learnt

A lot of things were new to learn but the main things learnt were;

1. SQLite
2. Code Reusability
3. Try and Except
4. Inheritance directly in coding.
5. Databases.
6. Comfort with static methods.

Future Expansions

In the future we'd like to add;

1. Implement the application on GUI using PyQT5 or Tkinter or any other suitable library.

2. An emailing system that directly emails the person if he or she has a book that is due.

3. A fine system, which calculates the fine according to the due date and Borrow date.

4. A system that enjoins group accounts or accounts from friends and/or family.

5. A website where an online server based system would exist.

6. With the website we could include, EBooks and Audio Books for the whole catalogue that we already have present.

7. With the books borrowed history, added will be the day on which the book was borrowed with the date.

Test Runs

Case 01: Wrong password or username used for admin.

```
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 1
To log in as Admin:
Enter username: Library Admin
Enter password: Admin_123
Username or password is incorrect.
To try again, press 1,
to return to the main menu, press  2,
to exit the program, press 3.
Enter choice: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: admin_123
Username or password is incorrect.
To try again, press 1,
to return to the main menu, press  2,
to exit the program, press 3.
Enter choice: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: Admin_123
You have Successfully Logged in!
Welcome Admin
Menu:
1. Add Books
2. Show all books available in the library
3. Show all borrowed books
4. Delete Books
5. Update Book Information
6. Search Book
7. Show all students
8. Search Student
9. Delete Student
10. Log out
Enter Option Number:
```

Case 02: Correct inputs of admin.

```
Enter choice: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: admin_123
Username or password is incorrect.
To try again, press 1,
to return to the main menu, press  2,
to exit the program, press 3.
Enter choice: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: Admin_123
You have Successfully Logged in!
Welcome Admin
Menu:
1. Add Books
2. Show all books available in the library
3. Show all borrowed books
4. Delete Books
5. Update Book Information
6. Search Book
7. Show all students
8. Search Student
9. Delete Student
10. Log out
Enter Option Number: 1
Enter title of book: Book5
Enter author's name: Author5
Enter Book_ID: 1005
Enter the number of copies of this book available: 6
New Book information successfully added!
Enter Option Number: 2
```

Book Title	Book Author	Book ID	No. of copies available
Book4	Author4	1004	5
Book2	Author02	1002	5
Book3	Author3	1003	5
Book5	Author5	1005	6

```
Enter Option Number: 3
```

Book Title	Book Author	Book ID	Name of borrower
Book3	Author3	1003	student3
Book4	Author4	1004	student4
Book3	Author3	1003	student2

```
Enter Option Number: 4
Enter the Book ID of the book that you want to delete: 1002
Record successfully deleted!
Enter Option Number: 5
Enter the ID of the book that you want to update: 1003
```

Book Title	Book Author	Book ID	No. of copies available
Book3	Author3	1003	5

```
Enter the value you want to update: 5
Enter the new value: 7
Record successfully updated!
Enter Option Number: 6
Enter the Book ID of the book that you want to search: 1005
```

Book Title	Book Author	Book ID	No. of copies available
Book5	Author5	1005	6

```
Enter Option Number: 7
Student Record:
```

First Name	Last Name	Email address	Username	Password	History
First1	Last1	123@gmail.com	student1	1234	1003
First3	Last3	789@gmail.com	student3	3456	1003
First2	Last2	456@gmail.com	student2	2345	1003

```
Enter Option Number: 10
Logged out successfully!
```

Case 03: Creating an account for student.

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.2
Welcome new user. Please enter your informaion to create account.
Enter first name: First1
Enter last name: Last1
Enter email address: 123@gmail.com
Enter the username you want to set: student1
Enter password: 123
Re enter password: 123
Account Successfully created!
Welcome Student
```

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.2
Welcome new user. Please enter your informaion to create account.
Enter first name: First2
Enter last name: Last2
Enter email address: 456@gmail.com
Enter the username you want to set: student2
Enter password: 2345
Re enter password: 2345
Account Successfully created!
Welcome Student
```

Case 04: When username already exists.

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.2
Welcome new user. Please enter your informaion to create account.
Enter first name: First4
Enter last name: Last4
Enter email address: 912@gmail.com
Enter the username you want to set: student3
The username already exists. Please try another username.
Enter the username you want to set: student4
Enter password: 4567
Re enter password: 4567
Account Successfully created!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number:
```

Case 05: Wrong username or password for student.

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student
Enter password: 1234
Incorrect username or password :(
To try again, press 1,
to return to the main menu, press  2,
to create a new account, press 3,
to exit the program, press 4.
Enter choice: 1
To log in as Student:
Enter username: student1
Enter password: 123
Incorrect username or password :(
To try again, press 1,
to return to the main menu, press  2,
to create a new account, press 3,
to exit the program, press 4.
Enter choice: 1
To log in as Student:
Enter username: student1
Enter password: 1234
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
```

```
5. Update Self Information
6. Log out
Enter Option Number: 1
Book Title                    Book Author                   Book ID
Book2                         Author02                        1002
Book3                         Author3                         1003
Book4                         Author4                         1004
Enter Option Number:
```

Case 06: Correct inputs of student.

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student4
Enter password: 4567
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number: 1
Book Title                      Book Author                     Book ID
Book2                           Author02                           1002
Book4                           Author4                            1004
Book3                           Author3                            1003
Enter Option Number: 2
Enter the Book ID of the book, or press any letter to see all books: 1002
Book Title                      Book Author                     Book ID
Book2                           Author02                           1002
Press *1* to confirm. Else press *0* search another book: 1
Book Borrowed!
Enter Option Number: 3
Book Title                      Book Author                     Book ID
Book2                           Author02                           1002
Enter Y to confirm the return: Y
Book successfully returned!
Enter Option Number: 2
Enter the Book ID of the book, or press any letter to see all books: 1004
Book Title                      Book Author                     Book ID
Book4                           Author4                            1004
Press *1* to confirm. Else press *0* search another book: 1
Book Borrowed!
Enter Option Number: 4
The Book IDs of your borrowed books are as follows:
1002
1004
Enter Option Number: 5
for student4, you can update the following info:
First Name            Last Name             Email address         Password
First4                Last4                 912@gmail.com         4567
Enter the information you want to update (The information is case sensitive): 4567
Enter the new information (The infomation is case sensitive): 45678
Self Information successfully updated. Your information is as follows:
username: student4
First Name            Last Name             Email address         Password
First4                Last4                 912@gmail.com         45678
Enter Option Number: 6
Logged out successfully!
Press 1 to log in to another account, press any other key to exit the application: 1
```

Case 07: To view books

```
Are you a Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student2
Enter password: 2345
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number: 2
Enter the Book ID of the book, or press any letter to see all books: f
Book Title                      Book Author                      Book ID
Book3                           Author3                             1003
Book4                           Author4                             1004
Book2                           Author02                            1002
Enter the Book ID of the book, or press any letter to see all books: 1003
Book Title                      Book Author                      Book ID
Book3                           Author3                             1003
Press *1* to confirm. Else press *0* search another book: 1
Book Borrowed!
Enter Option Number: 4
The Book IDs of your borrowed books are as follows:
1003
Enter Option Number:
```

Case 08: Borrowing two books at a time.

```
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student2
Enter password: 2345
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number: 1
Book Title                      Book Author                     Book ID
Book3                           Author3                            1003
Book2                           Author02                           1002
Book4                           Author4                            1004
Enter Option Number: 2
You can not borrow another book before returning the first one.
Enter Option Number: 3
Book Title                      Book Author                     Book ID
Book3                           Author3                            1003
Enter Y to confirm the return: Y
Book successfully returned!
Enter Option Number: 2
Enter the Book ID of the book, or press any letter to see all books: 1003
Book Title                      Book Author                     Book ID
Book3                           Author3                            1003
Press *1* to confirm. Else press *0* search another book: 1
Book Borrowed!
Enter Option Number:
```

Case 09: Searching and deleting students.

```
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: Admin_123
You have Successfully Logged in!
Welcome Admin
Menu:
1. Add Books
2. Show all books available in the library
3. Show all borrowed books
4. Delete Books
5. Update Book Information
6. Search Book
7. Show all students
8. Search Student
9. Delete Student
10. Log out
Enter Option Number: 7
Student Record:
First Name            Last Name            Email address         Username              Password              History
First1                Last1                123@gmail.com         student1              1234                  1003
First3                Last3                789@gmail.com         student3              3456                  1003
First2                Last2                456@gmail.com         student2              2345                  1003
Enter Option Number: 8
Enter the email address of the student that you want to search: 123@gmail.com
First Name            Last Name            Email address         Username              Password              History
First2                Last2                456@gmail.com         student2              2345                  1003
Enter Option Number: 9
Enter the User name of the student that you want to delete: student3
Record successfully deleted!
Enter Option Number: 7
Student Record:
First Name            Last Name            Email address         Username              Password              History
First1                Last1                123@gmail.com         student1              1234                  1003
First2                Last2                456@gmail.com         student2              2345                  1003
Enter Option Number: 10
Logged out successfully!
Press 1 to log in to another account, press any other key to exit the application:
```

Case 10: Switching user.

```
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: Admin_123
You have Successfully Logged in!
Welcome Admin
Menu:
1. Add Books
2. Show all books available in the library
3. Show all borrowed books
4. Delete Books
5. Update Book Information
6. Search Book
7. Show all students
8. Search Student
9. Delete Student
10. Log out
Enter Option Number: 10
Logged out successfully!
Press 1 to log in to another account, press any other key to exit the application: 1
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student2
Enter password: 2345
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number: 6
Logged out successfully!
Press 1 to log in to another account, press any other key to exit the application:
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 2
Hello Student. Please,
hit 1 to log in to your account,
hit 2 to create account.1
To log in as Student:
Enter username: student1
Enter password: 1234
Login Successful!
Welcome Student
Menu:
1. Show all books available in the library
2. Borrow a Book
3. Return a Book
4. History of borrowed books
5. Update Self Information
6. Log out
Enter Option Number: 6
Logged out successfully!
Press 1 to log in to another account, press any other key to exit the application:
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 1
To log in as Admin:
Enter username: LibraryAdmin
Enter password: Admin_123
You have Successfully Logged in!
```

Docstrings:

```
>>> Functions.__doc__
'Functions has all static methods.\n\n    Contains all the methods to implement
database functions.\n    '
>>> User.__doc__
'Serves as the abstract class for Admin and Student.\n\n    Has three abstract m
ethods. \n    '
>>> Admin.__doc__
'Inherits from User and Functions.\n\n    Overrides all the abstract methods pro
vided in the base class.\n    '
>>> Student.__doc__
'Inherits from User and Functions.\n\n    Overrides all the abstract methods pro
vided in the base class.\n    '
>>> Login.__doc__
'Provides the main menu of the program.\n\n        Is associated with the Admin
and the Student class.\n    '
>>>
```

Calling the help function:

```
============= RESTART: C:\Users\Haroon traders\Downloads\werdah.py =============
For Admin:
        Username: LibraryAdmin
        Password: Admin_123
Are you an Admin or a Student? Enter 1 for Admin, 2 for Student, 3 to Exit: 3
>>> help(Student)
Help on class Student in module __main__:

class Student(User, Functions)
 |  Inherits from User and Functions.
 |
 |  Overrides all the abstract methods provided in the base class.
 |
 |  Method resolution order:
 |      Student
 |      User
 |      abc.ABC
 |      Functions
 |      builtins.object
 |
 |  Methods defined here:
 |
 |  Sign_in(self)
 |      Provides the Login procedure for Student.
 |
 |  Sign_up(self)
 |      Provides the Signup procedure for Student.
 |
 |  __init__(self)
 |      Allows the user to either log in, or create a new account.
 |
 |
 |  open_menu(self)
 |      Opens the main menue panel for the Student.
 |
 |  ----------------------------------------------------------------------
 |  Data and other attributes defined here:
 |
 |  __abstractmethods__ = frozenset()
 |
 |  ----------------------------------------------------------------------
 |  Data descriptors inherited from User:
 |
 |  __dict__
 |      dictionary for instance variables (if defined)
 |
 |  __weakref__
 |      list of weak references to the object (if defined)
 |
 |  ----------------------------------------------------------------------
 |  Static methods inherited from Functions:
 |
 |  add_rec(name_of_db, name_of_table='', *x)
 |      Adds the records to the databases.
 |
 |      Takes the arguments of the name of database and the table in
 |      which the values are to be added. The values to be added are
 |      passed as the args and then inserted into the table.
 |
 |  delete_rec(name_of_db='', name_of_table='', col='', x='')
 |      Just deletes the record from the table.
 |      Takes the argument of the name of database and the name of the
 |      table, along with the name of column and the value whose record
 |      is to be deleted. If the value is found, the record is deleted.
 |
 |  search_rec(name_of_db, name_of_table='', col='', x='')
 |      Returns a tuple of the data that was to be searched.
 |
 |      Takes the argument of name of database and table, where the
 |      required data is present. Also takes the argument of the column
 |      to be searched in, and the value to be searched.
 |
 |  showAll(name_of_db, name_of_table='')
 |      Returns all the records present in a table, as tuples, in a main list.
 |
 |      Takes the arguments of the name of database and the name of
 |      the table, for the data to be fetched from.
 |
 |  show_rec(name_of_db='', name_of_table='', search_val=0)
 |      Takes the arguments of the name of database and the name of
 |      the table, and the value to search, from any column.
 |
 |      Returns the list of the record if the value is found in any,
 |      else returns an empty list.
 |
 |  update_rec(name_of_db='', name_of_table='', record=[], with_val=0, what_val=0)
 |      Updates a record of the table.
 |
 |      Takes the argument of name of database, name of table, the
 |      record to be updated (of list data type), the value to be
 |      changed, and the new value.
```