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المملكة العربية السعودية

وزارة التعليم

كليات عنيزة الأهلية

كلية الهندسة وتقنية المعلومات

قسم الامن السبراني

# library management system using single linked list

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# Introduction

Data structures play an essential role in computer science as they provide efficient ways to organize, store, and manage data. They enable programs to handle information in a structured format that allows easier processing and retrieval. One of the commonly used data structures is the Linked List, which stores data in sequential nodes that are connected together dynamically. Unlike arrays, linked lists allow insertion and deletion without shifting elements, which makes them more flexible in applications where data changes frequently.

In this project, a simple Library Management System is implemented using the principles of data structures. Each book in the system contains information such as the title, author, and publication year, which are stored inside a structured object. The program allows users to add new books, delete existing ones, search for a specific book, update book details, and display all stored books. These operations demonstrate how data can be handled using list-based structures and show the practical importance of data organization.



\*الكود.py - C:/Python313/الكود.py (3.13.7)\*

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# This class represents a Book object that stores title, author, and publication year

class Book:

# Constructor that initializes the book information

def \_\_init\_\_(self, title, author, year):

self.title = title # Stores the book title

self.author = author # Stores the book author

self.year = year # Stores the publish year

# This method displays the book details when called

def display(self):

print(f"Title: {self.title}")

print(f"Author: {self.author}")

print(f"Year: {self.year}")

print("-----")

# This class represents the Library which works as a list of Book objects

class Library:

# Constructor that initializes an empty library list

def \_\_init\_\_(self):

self.books = [] # Acts as a simple linked list to store books

# This method adds a new book to the library list

def add\_book(self):

title = input("Enter book title: ")

author = input("Enter book author: ")

year = input("Enter publish year: ")

# Create a new Book object and append it to the list

new\_book = Book(title, author, year)

self.books.append(new\_book)

print("Book added successfully!\n")

# This method prints all books in the library

def show\_books(self):

# Checks if the library is empty

if not self.books:

print("No books in the library yet.\n")

return

print("\n--- Library Books ---")

# Iterates through the list and displays each book

for book in self.books:

book.display()

# This method searches for a book by title

def search\_book(self):



\*الكود.py - C:/Python313/الكود.py (3.13.7)\*

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```
# This method searches for a book by title
def search_book(self):
    title = input("Enter title to search: ")
    found = False

    # Loops through books and compares titles (case insensitive)
    for book in self.books:
        if book.title.lower() == title.lower():
            print("\nBook Found:")
            book.display()
            found = True

    # If book not found
    if not found:
        print("Book not found.\n")

# This method deletes a book based on its title
def delete_book(self):
    title = input("Enter title of the book to delete: ")
    # Loops to find the matching book
    for book in self.books:
        if book.title.lower() == title.lower():
            self.books.remove(book) # Removes the book from the list
            print("Book deleted successfully!\n")
            return
    print("Book not found.\n")

# This method updates the information of an existing book
def update_book(self):
    title = input("Enter the book title to update: ")
    # Searches for the book to update
    for book in self.books:
        if book.title.lower() == title.lower():
            print("Leave field empty if you don't want to change it.")

            new_title = input("New title: ")
            new_author = input("New author: ")
            new_year = input("New year: ")

            # Updates only if a new value was entered
            if new_title:
                book.title = new_title
            if new_author:
                book.author = new_author
            if new_year:
                book.year = new_year
```



```

*الكود.py - C:/Python313/الكود.py (3.13.7)*
File Edit Format Run Options Window Help
    book.title = new_title
    if new_author:
        book.author = new_author
    if new_year:
        book.year = new_year

    print("Book updated successfully!\n")
    return

    print("Book not found.\n")

# ----- MAIN MENU -----
# Creates a Library object to access its methods
library = Library()

# Infinite loop that keeps the program running until user exits
while True:
    print("==== Library Menu =====")
    print("1. Add Book")
    print("2. Show All Books")
    print("3. Search Book")
    print("4. Delete Book")
    print("5. Update Book")
    print("6. Exit")

    # User enters a choice for operation
    choice = input("Enter choice: ")

    # Calls the corresponding function based on user input
    if choice == "1":
        library.add_book()
    elif choice == "2":
        library.show_books()
    elif choice == "3":
        library.search_book()
    elif choice == "4":
        library.delete_book()
    elif choice == "5":
        library.update_book()
    elif choice == "6":
        print("Exiting program...")
        break
    else:
        # Handles invalid menu selections
        print("Invalid choice. Try again.\n")

```



```
>>>
=====
==== Library Menu =====
1. Add Book
2. Show All Books
3. Search Book
4. Delete Book
5. Update Book
6. Exit
Enter choice: |
```

This section displays the main interface of the 'Library Management System' (Library Menu), which provides the user with 6 core options for managing the book collection (Add, Show, Search, Delete, Update, Exit)

\*In Python, lists do not use size(); instead, the built-in function len() is used to get the number of elements.





```
=====
===== Library Menu =====
1. Add Book
2. Show All Books
3. Search Book
4. Delete Book
5. Update Book
6. Exit
Enter choice: 1
Enter book title: To Kill a Mockingbird
Enter book author: Harper Lee
Enter publish year: 1960
Book added successfully!

===== Library Menu =====
1. Add Book
2. Show All Books
3. Search Book
4. Delete Book
5. Update Book
6. Exit
Enter choice: 1
Enter book title: 1984
Enter book author: George Orwell
Enter publish year: 1949
Book added successfully!

..
```

The user selected Option 1 (Add Book) to register a new book. The book details (Title, Author, Year) were entered, and the addition process was completed successfully



```
===== Library Menu =====
1. Add Book
2. Show All Books
3. Search Book
4. Delete Book
5. Update Book
6. Exit
Enter choice: 2

--- Library Books ---
Title: To Kill a Mockingbird
Author: Harper Lee
Year: 1960
-----
Title: 1984
Author: George Orwell
Year: 1949
```

user selected option number 2 (Show All Books), and the system displayed all the books that the user had previously added to the library





```
-----  
===== Library Menu =====  
1. Add Book  
2. Show All Books  
3. Search Book  
4. Delete Book  
5. Update Book  
6. Exit  
Enter choice: 3  
Enter title to search: To Kill a Mockingbird  
  
Book Found:  
Title: To Kill a Mockingbird  
Author: Harper Lee  
Year: 1960  
-----
```

user selected option 3 (Search Book), then entered the book title "To Kill a Mockingbird"  
The book was successfully found, and all its details (Title, Author, and Year) were displayed



```
-----  
===== Library Menu =====  
1. Add Book  
2. Show All Books  
3. Search Book  
4. Delete Book  
5. Update Book  
6. Exit  
Enter choice: 4  
Enter title of the book to delete: 1984  
Book deleted successfully!
```

The user selected option 4 (Delete Book) to remove a book. The user entered the title of the book to be deleted, which was '1984', and the deletion process was successful the book was removed from the library list



```
===== Library Menu =====
```

```
1. Add Book
```

```
2. Show All Books
```

```
3. Search Book
```

```
4. Delete Book
```

```
5. Update Book
```

```
6. Exit
```

```
Enter choice: 5
```

```
Enter the book title to update: To Kill a Mockingbird
```

```
Leave field empty if you don't want to change it.
```

```
New title: Frankenstein
```

```
New author: Mary Shelley
```

```
New year: 2003
```

```
Book updated successfully!
```

The user selects option 5 (Update Book) to modify the details of an existing book. First, the title of the book to be updated is entered, then the user is prompted to enter new values (for the Title, Author, or Year of Publication), and the book is successfully updated

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```
==== Library Menu ====
1. Add Book
2. Show All Books
3. Search Book
4. Delete Book
5. Update Book
6. Exit
Enter choice: 6
Exiting program...
```

The user selects option 6 (Exit) to terminate the program. A message is displayed confirming the exit from the system, and the program stops running