Department of Computer Science

Academic Year	**2026**
Semester	☐ Fall ☒ Spring ☐ Summer
Course Code - Name	CPS 240 – Object Oriented Programming, A&D
Instructor	Dr. Razi Iqbal
Assessment	Assignment 2
Deadline	February 23rd, 2026

Assignment 2

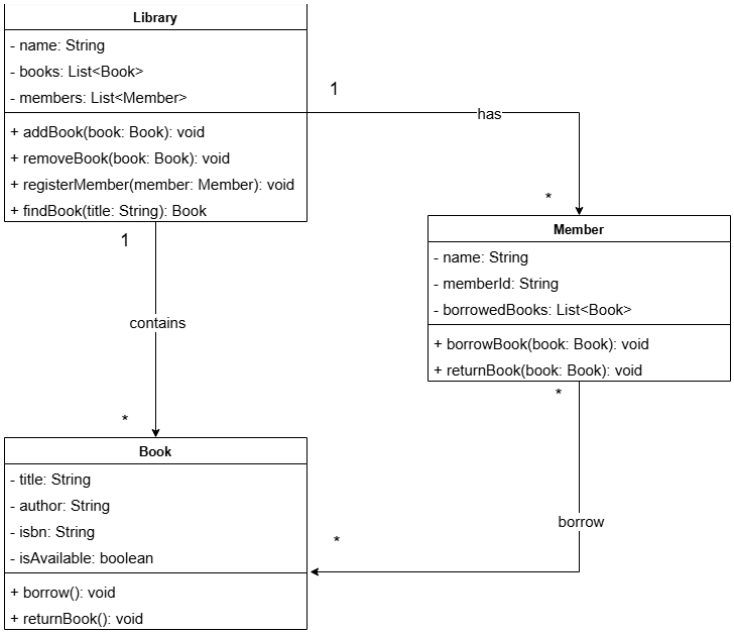
The main purpose of this lab is to test your knowledge of Unified Modeling Language (UML).

Instructions:

- You are required to submit your source (.java) files on Blackboard.
- Students having exactly similar code will get a straight 0.
- Comment on your code appropriately. Failing to do so would result in losing marks.
- The deadline for submission of this assessment is **February 23rd, 2026**.
- A late penalty of 10% per day late will be applied, in the absence of a medical note, to a maximum of 2 days late. After 2 days, the assignment will not be accepted.

Question

In this exercise, you are provided a UML diagram for a Library Management System. Your job is to convert this UML diagram into its corresponding Java code.



You are required to write a Java program that creates 3 Java classes **`Library`**, **`Book`** and **`Member.`** The UML diagram above shows the data members and member functions of each class. As per the above diagram, **`Library`** class should manage a collection of **`Book`** and **`Member`** objects and implements methods to add/remove books and register members. It also implements the borrowing and returning of books through the **`Member`** class. Please note the following about the classes:

`Book` Class contains:

- A parameterized constructor to map **`title`**, **`author`**, **`isbn`** and **`isAvailable`**
  - **`isAvailable`** should initially be `true`
- Getter and Setter methods
- `borrow`() function:
  - Checks if book is available (**`isAvailable`** == `true`), prints a message that book is borrowed and make **`isAvailable`** `false`
  - Checks if book is not available, prints a message that book is currently unavailable.
- `returnBook`() function:
  - Makes **`isAvailable`** `true`
  - Prints a message that the book with **`title`** has been returned

`Member` Class contains:

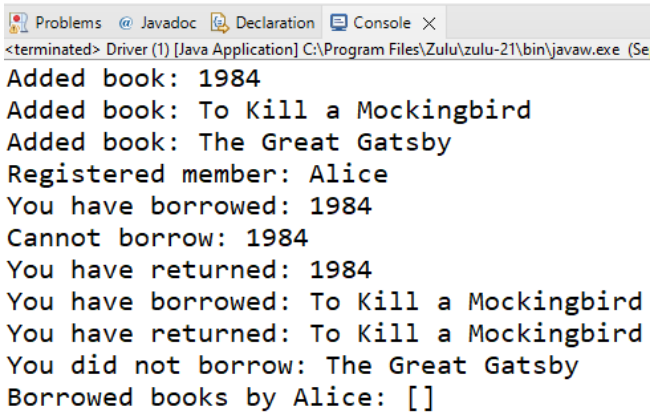
- A parameterized constructor to initialize **`name`**, **`memberId`**, and **`borrowedBooks`**
  - **`borrowedBooks`** should be initialized to a new `ArrayList<>`

- Getter and Setter methods
- `borrowBook(Book book)` function:
  - Checks if book is available, calls the `borrow()` method on **`Book`** object and adds this `book` to **`borrowedBooks`** list.
  - Checks if book is not available, prints a message that book **`title`** cannot be borrowed.
- `returnBook(Book book)` function:
  - Checks if **`borrowedBooks`** list contains the `book`, `returnBook()` method is called on that `book` object and the `book` is removed from **`borrowedBooks`** list.
  - Prints a message that book **`title`** was not borrowed

`Library` Class contains:

- A parameterized constructor to initialize **`name`**, **`books`** and **`members`**.
  - **`books`** should be initialized to a new `ArrayList<>`
  - **`members`** should be initialized to a new `ArrayList<>`
- Getter and Setter methods
- `addBook(Book book)` function:
  - Adds `book` to **`books`**
  - Prints a message that book **`title`** is added.
- `removeBook(Book book)` function:
  - Removes `book` from **`books`**
  - Prints a message that book **`title`** is removed.
- `registerMember(Member member)` function:
  - Adds `member` from **`members`**
  - Prints a message that member **`name`** is registered.
- `findBook(String title)` function:
  - Searches for `title` in **`books`** and returns the **`book`**
  - Returns **`null`** if no such book is found.

Below is the expected output of the program:



The Code for **`Driver`** class with **`main`** method is provided below.

```
import java.util.Arrays;
import java.util.List;

public class Driver {

        public static void main(String[] args) {
         Library library = new Library("Local Library");

         Book book1 = new Book("1984", "George Orwell", "123456789");
         Book book2 = new Book("To Kill a Mockingbird", "Harper Lee", "987654321");
         Book book3 = new Book("The Great Gatsby", "F. Scott Fitzgerald", "543216789");

         library.addBook(book1);
         library.addBook(book2);
         library.addBook(book3);

         Member member = new Member("Alice", "M001");
         library.registerMember(member);

         member.borrowBook(book1); // Should succeed
         member.borrowBook(book1); // Should fail (already borrowed)
         member.returnBook(book1); // Should succeed
         member.borrowBook(book2); // Should succeed
         member.returnBook(book2); // Should succeed
         member.returnBook(book3); // Should fail (not borrowed)

         System.out.println("Borrowed books by " + member.getName() + ": " +
member.getBorrowedBooks());
    }
}
```