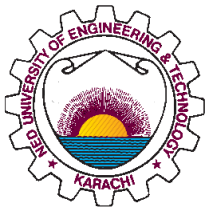


NED UNIVERSITY OF
ENGINEERING AND TECHNOLOGY

ASSIGNMENT:

EXCEPTION HANDLING

COURSE NAME:

OBJECT ORIENTED PROGRAMMMING

COURSE CODE:

CS-116

SUBMITTED TO:

Ms. Ramish Fatima

SUBMITTED BY:

Usman Rasheed Siddiqui (CS-24038)

Huzaifa Hanif (CS-24039)

DATED: 9TH MAY 2025

CODE:

```
# Custom exception classes for handling specific exceptions in the Library System
class UserNotFoundError(Exception):
    """Custom exception for when a user is not found in the system"""
    def __init__(self):
        self.message = 'User not found'
        super().__init__(self.message)

    def __str__(self):
        return self.message

class PasswordNotMatchError(Exception):
    """Custom exception for when password doesn't match user records"""
    def __init__(self):
        self.message = 'Password does not match'
        super().__init__(self.message)

    def __str__(self):
        return self.message

class AlreadyExistError(Exception):
    """Custom exception for duplicate usernames/passwords"""
    pass    # Raised when a username or password already exist

class BookNotAvailableError(Exception):
    """Custom exception when trying to borrow unavailable book"""
    pass    # Raised when a book is not available for borrowing

class BookNotFoundError(Exception):
    """Custom exception when book doesn't exist in library"""
    pass    # Raised when a book doesn't exist in the library

class BalanceError(Exception):
    """Custom exception for invalid balance operations"""
    pass    # Raised for balance-related issues

class PasswordRangeError(Exception):
    """Custom exception for password length violations"""
    pass    # Raised when password doesn't meet length requirements

class BookNotBorrowedError(Exception):
    """Custom exception when returning unborrowed book"""
    pass    # Raised when trying to return a book that wasn't borrowed

class Library:
    def __init__(self, name="", password="", book=""):
        # Initialize library with default values
        self.name = name            # Current user's name
        self.password = password    # Current user's password
        self.book = book            # Current book being processed
        self.cost = 0               # Cost of current book
        self.balance = 0            # Current user's balance
```

```
        self.main_menu()            # Start with main menu

    # Predefined user accounts with passwords, borrowed books, and balances
    _accounts = {
        "Alice": {
            "password": "alice123",
            "borrowed": [],
            "balance": 500,
        },
        "Ahmed": {
            "password": "Ahmed#886",
            "borrowed": [],
            "balance": 300,
        },
        "Charlie": {
            "password": "charliePwd!",
            "borrowed": [],
            "balance": 750,
        },
        "Ayesha": {
            "password": "AyeshaSecret",
            "borrowed": [],
            "balance": 1000,
        },
        "Ali": {
            "password": "Ali_e",
            "borrowed": [],
            "balance": 200,
        }
    }

    # Predefined books with their details
    _books = {
        "101": {"title": "Dr. Jekyll and Mr. Hyde", "cost": 100, "available": True},
        "102": {"title": "To Kill a Mockingbird", "cost": 250, "available": True},
        "103": {"title": "1984", "cost": 180, "available": True},
        "104": {"title": "The Great Gatsby", "cost": 220, "available": False},
        "105": {"title": "Pride and Prejudice", "cost": 150, "available": True},
        "106": {"title": "The Hobbit", "cost": 300, "available": True},
        "107": {"title": "Harry Potter and the Sorcerer's Stone", "cost": 350,
"available": False},
        "108": {"title": "The Catcher in the Rye", "cost": 190, "available": True},
        "109": {"title": "Brave New World", "cost": 210, "available": True},
        "110": {"title": "The Alchemist", "cost": 170, "available": True}
    }

    @classmethod
    def accounts(cls):
        """Class method to access accounts dictionary"""
        return cls._accounts

    @classmethod
    def books(cls):
        "Class method to access books dictionary"
        return cls._books
```

```
    def quit_choice(self, choice):
        """Check if user wants to quit (entered 'q' or 'Q')"""
        if choice == "q" or choice == "Q":
            return True
        return False

    def login(self):
        """Handle user login process"""
        print()
        print("=" * 30)
        print("Login")
        print("=" * 30)
        print()
        print("Enter q/Q at any time to quit to main menu.")

        # Get username and password
        self.name = input("Enter your name: ").strip()
        if self.quit_choice(self.name):
            return self.main_menu()
        self.password = input("Enter your password: ").strip()
        if self.quit_choice(self.password):
            return self.main_menu()

        # Validate credentials
        while True:
            try:
                # Get username and password with quit option
                user_found = False
                for account, details in Library.accounts().items():
                    if account.lower() == self.name.lower():
                        user_found = True
                        if details["password"] == self.password:
                            self.name = account
                            print(f"Password matched\nWelcome Mr./Mrs.
{self.name.upper()}")
                            return True     # Successful login
                        else:
                            # EXCEPTION: Wrong password
                            raise PasswordNotMatchError

                # EXCEPTION: User not found
                if not user_found:
                    raise UserNotFoundError()

            except UserNotFoundError as e:      # HANDLE: User doesn't exist
                print("Error:",e)
                break
            except PasswordNotMatchError as e:  # HANDLE: Incorrect password
                print("Error:",e)
                break

    def make_account(self):
        """Handle new account creation"""
        print()
```

```
        print("="*30)
        print("Sign Up")
        print("="*30)
        print()
        print("Enter q/Q at any time to quit to main menu.")

        # Get and validate username
        while True:
            try:
                self.name = input("Enter your name: ").strip()
                if self.quit_choice(self.name):
                    return self.main_menu()

                # EXCEPTION: Invalid name format
                if not self.name.isalpha() or not self.name:
                    raise TypeError("Enter Correct Name (letter only, no spaces
allowed)")
                for account in Library.accounts().keys():

                    # EXCEPTION: Username already exists
                    if account.lower() == self.name.lower():
                        raise AlreadyExistError()
                break
            except TypeError as e:          # HANDLE: Invalid name format
                print("Error:",e)
            except AlreadyExistError:       # HANDLE: Duplicate username
                print("Username already exists")

        # Get and validate password
        while True:
            try:
                self.password = input("Enter your password (8+ characters): ").strip()
                if self.quit_choice(self.password):
                    return self.main_menu()

                # EXCEPTION: Empty password
                if not self.password:
                    raise ValueError("This field is required")

                # EXCEPTION: Password too short
                if len(self.password) < 8:
                    raise PasswordRangeError("Password must be at least 8 characters
long")
                for account in self.accounts().values():

                    # EXCEPTION: Duplicate password
                    if account["password"] == self.password:
                        raise AlreadyExistError
                break
            except ValueError as e:                 # HANDLE: Empty password
                print("Error:",e)
            except AlreadyExistError:               # HANDLE: Duplicate password
                print("Password already exists")
            except PasswordRangeError as e:         # HANDLE: Short password
                print("Error:",e)
```

```
        # Get and validate initial balance
        while True:
            try:
                self.balance = input("Enter your balance: ")
                if self.quit_choice(self.balance):
                    return self.main_menu()

                # EXCEPTION: Empty balance
                if not self.balance.isdigit():
                    raise TypeError
                self.balance = int(self.balance)

                # EXCEPTION: Too small balance
                if self.balance <= 100:
                    raise ValueError("Balance must be greater than 100")

                # EXCEPTION: Too large balance
                if self.balance > 5000:
                    raise OverflowError("Balance is exceeding limit. Your total
balance should be at most 5000.")
                break
            except TypeError:               # HANDLE: Empty balance
                print("Invalid balance")
            except ValueError as e:         # HANDLE: Too small balance
                print("Error:",e)
            except OverflowError as e:      # HANDLE: Too large balance
                print("Error:",e)

        # Create new account with validated details
        account ={
        "password": self.password,
        "borrowed": [],
        "balance": self.balance,
        }

        Library._accounts[self.name] = account

        print("Account created successfully. Please login to access your account.")
        return self.main_menu()


    def save_book_id(self, id):
        """Update user account after borrowing a book"""
        for account, details in self.accounts().items():
            if account == self.name:
                if details["balance"] < self.cost:
                    print("You have insufficient balance")
                    self.user_menu()
                    break
                details["borrowed"].append(id)      # Add book to borrowed list
                details["balance"] -= self.cost     # Deduct cost from balance
                print(f"You succesfully borrowed this book. Your account balance is
now {details['balance']}")
                break
```

```
    def borrow_book(self):
        """Handle book borrowing process"""
        print()
        print("=" * 30)
        print("Borrowing Book")
        print("=" * 30)
        print()
        print("Enter q/Q at any time to quit to user menu.")

        # Taking input for book and validating the input
        try:
            self.book = input("Enter available book's id to borrow: ")
            if self.quit_choice(self.book):
                return self.user_menu()
            book_found = False

            # EXCEPTION: Book doesn't exist
            if self.book not in Library.books():
                raise KeyError("Book ID does not exist")

            for account, details in Library.accounts().items():
                if account == self.name:
                    # EXCEPTION: Book already borrowed by user
                    if self.book in details["borrowed"]:
                        raise AlreadyExistError

            # Process book borrowing
            for         id, book in Library.books().items():
                if self.book == id:
                    book_found = True

                    # EXCEPTION: Book not available
                    if book["available"]:
                        self.cost = book["cost"]
                        self.save_book_id(self.book)
                    else:
                        raise BookNotAvailableError

            # EXCEPTION: Book not found
            if not book_found:
                raise BookNotFoundError
        except BookNotAvailableError:                       # HANDLE: Book not
available
            print("This book is currently not available")
        except BookNotFoundError:                           # HANDLE: Book doesn't
exist
            print("Sorry! We don't have this book")
        except KeyError as e:                               # HANDLE: Invalid book ID
format
            print("Error:",e)
        except AlreadyExistError:                           # HANDLE: Already borrowed
by user
            print("Book is already borrowed by you. Please choose one you did not
borrow.")
```

```
        return self.user_menu()

    def return_book(self):
        print()
        print("=" * 30)
        print("Returning Book")
        print("=" * 30)
        print()
        print("Enter q/Q at any time to quit to user menu.")
        try:
            book_returned = False
            for account, details in Library.accounts().items():
                if account == self.name:

                    # EXCEPTION: No borrowed books
                    if not details["borrowed"]:
                        raise BookNotBorrowedError("No books borrowed")
                    id = input("Enter book ID: ")
                    if self.quit_choice(id):
                        return self.user_menu()

                    # EXCEPTION: Invalid book ID format
                    if not id.isdigit():
                        raise ValueError

                    # Process return
                    for book_id in details["borrowed"]:
                        if book_id == id:
                            book_returned = True
                            details["borrowed"].remove(id)
                            print("Book returned succesfully")
                            if id in Library.books():
                                Library.books()[id]["available"] = True
                            return self.user_menu()
                    if not book_returned:
                        raise BookNotBorrowedError("This book was not borrowed by
you")

        except ValueError:                  # HANDLE: Invalid book ID format
            print("Invalid book ID")

        except BookNotBorrowedError as e:   # HANDLE: Book not borrowed or no books
            print("Error:",e)

        return self.user_menu()

    def update_balance(self):
        """Handle balance update process"""
        try:
            # Get current user's account
            for account, details in Library.accounts().items():
                if account == self.name:
                    print("Enter q/Q at any time to quit to user menu.")
```

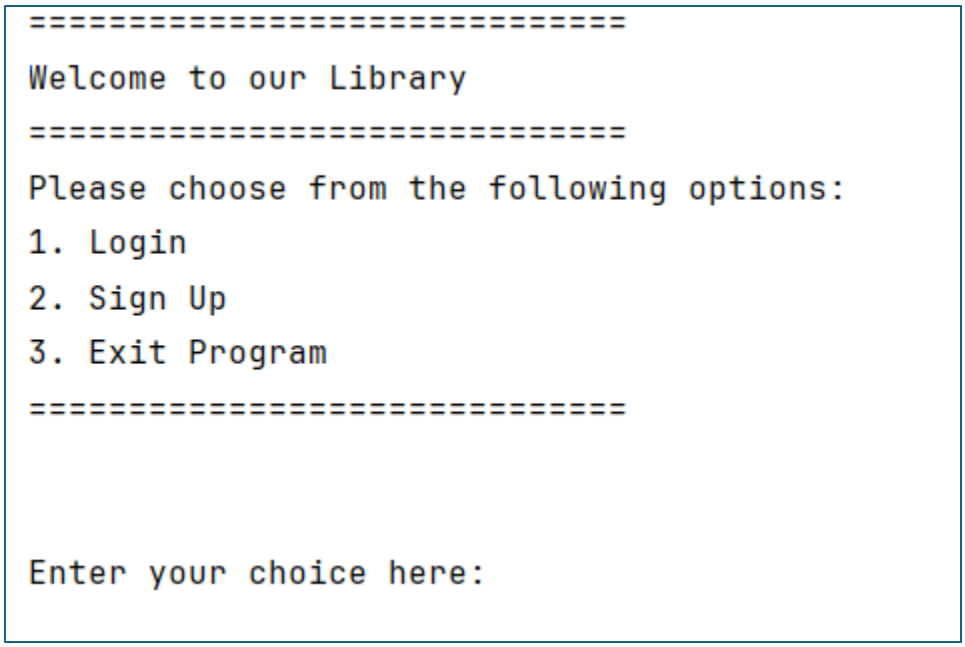
```
                    # Get user input for balance update
                    update_balance = input("Enter your new balance to be added: ")
                    if self.quit_choice(update_balance):
                        return self.user_menu()

                    # EXCEPTION: Validate input is numeric
                    if not update_balance.isdigit():
                        raise ValueError("Please enter a appropriate balance")
                    update_balance = int(update_balance)

                    # EXCEPTION: Check for positive amount
                    if update_balance <= 0:
                        raise ValueError("Balance must be greater than 0")

                    # EXCEPTION: Check total balance won't exceed 5000 limit
                    if (details["balance"] + update_balance) > 5000:
                        raise OverflowError("Balance is exceeding limit. Your total
balance should be at most 5000.")

                    # Update the balance
                    details["balance"] += update_balance

                    # EXCEPTION: Low Balance
                    if details["balance"] < 100:
                        raise BalanceError("Balance must be greater than 100")
                print("Balance updated successfully")

            except BalanceError as e:       # HANDLE: Balance problems
                print("Error:",e)
            except ValueError as e:         # HANDLE: Invalid numeric input
                print("Error:",e)
            except OverflowError as e:      # HANDLE: Balance would exceed maximum
                print("Error:", e)

        def status(self):
            """Display user's current status (borrowed books and balance)"""
            for account, details in Library.accounts().items():
                if account == self.name:
                    print("\n","="*30)
                    print(f"Borrowed Books ID: {details['borrowed'] if details['borrowed']
else 'No books borrowed'}")
                    print(f"Balance: {details['balance']}")
                    print("=" * 30)
                    print()

        def view_all_books_available(self):
            """Display all available books"""
            print("\n","="*30)
            print("Available Books")
            print("="*30)
            for id, book in Library.books().items():
                    if book.get("available"):
                        print("ID:", id, end="  |  ")
                        print(f"Title: {book['title']}  |  Cost: {book['cost']}  |
Availability: Available")
```

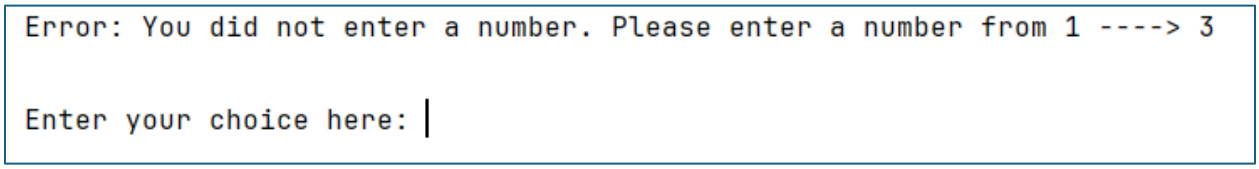
```
        print("=" * 30)
        print()

    def choice_main(self):
        """Handle main menu choices"""
        while True:
            try:
                choice = input("\nEnter your choice here: ")
                if choice == "1":
                    if self.login():
                        self.user_menu()
                    else:
                        self.main_menu()
                elif choice == "2":
                    self.make_account()
                elif choice == "3":
                    print("Thank you for using our application")
                    exit()

                #  EXCEPTION: Invalid entry
                if not choice.isdigit():
                    raise TypeError
                #  EXCEPTION: Invalid number entry
                if int(choice) < 1 or int(choice) > 3:
                    raise ValueError

            #  HANDLING: Invalid entry
            except TypeError:
                print("Error: You did not enter a number. Please enter a number from 1
----> 3")

            #  HANDLING: Invalid number entry
            except ValueError:
                print("Please enter a number from 1 ----> 3")

    def choice_user(self):
        """Handle user menu choices"""
        while True:
            try:
                print("Press q/Q to quit to main menu. (You have to then login
again)")
                choice = input("\nEnter your choice here: ")
                if self.quit_choice(choice):
                    return self.main_menu()
                if choice == "1":
                    self.borrow_book()
                elif choice == "2":
                    self.return_book()
                elif choice == "3":
                    self.update_balance()
                elif choice == "4":
                    self.status()
                elif choice == "5":
                    self.view_all_books_available()
                elif choice == "6":
```

```
                    self.main_menu()

                #  EXCEPTION: Invalid entry
                if not choice.isdigit():
                    raise TypeError
                #  EXCEPTION: Invalid number entry
                if int(choice) < 1 or int(choice) > 6:
                    raise ValueError

            #  HANDLING: Invalid entry
            except TypeError:
                print("Error: You did not enter a number. Please enter a number from 1
----> 6")

            #  HANDLING: Invalid number entry
            except ValueError:
                print("Please enter a number from 1 ----> 6")


    def main_menu_interface(self):
        """Display main menu options"""
        print("Please choose from the following options:")
        print("1. Login")
        print("2. Sign Up")
        print("3. Exit Program")
        print("=" * 30)
        print()

    def main_menu(self):
        """Display main menu and handle choices"""
        print("="*30)
        print("Welcome to our Library")
        print("="*30)
        self.main_menu_interface()
        self.choice_main()

    def user_menu_interface(self):
        """Display user menu options"""
        print("=" * 30)
        print(f"Mr./ Mrs {self.name.upper()}'s Dashboard")
        print("=" * 30)
        print("Please choose from the following options:")
        print("1. Borrow Book")
        print("2. Return Book")
        print("3. Update Balance")
        print("4. Check Status")
        print("5. View All Books Available")
        print("6. Exit to Main Menu")
        print("=" * 30)
        print()

    def user_menu(self):
        """Display user menu and handle choices"""
        self.user_menu_interface()
        self.choice_user()
```

```
# Create Library instance to start the program
L1 = Library()
```

SNIPPETS:





```
Enter your choice here: 2

==============================
Sign Up
==============================

Enter q/Q at any time to quit to main menu.
Enter your name: Usman
Enter your password (8+ characters): usman@12345
Enter your balance: dsf
Invalid balance
Enter your balance: 40000
Error: Balance is exceeding limit. Your total balance should be at most 5000.
Enter your balance: 500
Account created successfully. Please login to access your account.
```

```
==============================
Login
==============================

Enter q/Q at any time to quit to main menu.
Enter your name: usman
Enter your password: gsdgsgs
Error: Password does not match
```

```
Enter q/Q at any time to quit to main menu.
Enter your name: usman
Enter your password: usman@12345
Password matched
Welcome Mr./Mrs. USMAN
==============================
Mr./ Mrs USMAN's Dashboard
==============================
Please choose from the following options:
1. Borrow Book
2. Return Book
3. Update Balance
4. Check Status
5. View All Books Available
6. Exit to Main Menu
==============================

Press q/Q to quit to main menu. (You have to then login again)

Enter your choice here:
```

```
Enter your choice here: 1

==============================
Borrowing Book
==============================

Enter q/Q at any time to quit to user menu.
Enter available book's id to borrow: dg
Error: 'Book ID does not exist'
```

```
==============================
Borrowing Book
==============================

Enter q/Q at any time to quit to user menu.
Enter available book's id to borrow: 101
You succesfully borrowed this book. Your account balance is now 400
```

```
Enter your choice here: 3
Enter q/Q at any time to quit to user menu.
Enter your new balance to be added: 0
Error: Balance must be greater than 0
Press q/Q to quit to main menu. (You have to then login again)

Enter your choice here: 3
Enter q/Q at any time to quit to user menu.
Enter your new balance to be added: 800
Balance updated successfully
Press q/Q to quit to main menu. (You have to then login again)
```

```
Enter your choice here: 2


==============================
Returning Book
==============================

Enter q/Q at any time to quit to user menu.
Enter book ID: 103
Error: This book was not borrowed by you
```

```
Press q/Q to quit to main menu. (You have to then login again)

Enter your choice here: q
==============================
Welcome to our Library
==============================
Please choose from the following options:
1. Login
2. Sign Up
3. Exit Program
==============================
```