



# University of Information Technology and Sciences

Department of CSE

## Project Report

Course Code	CSE0613122
Course Title	Object-Oriented Programming Language Lab
Project No	01
Assignment Title	Library Management System
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Developed by:	Submitted to:
<b>Name:</b> Nurjamil Khanom Ashmika  <b>ID No:</b> 0432410005101018  <b>Batch:</b> CSE-55  <b>Section:</b> 2A1	<b>Name:</b> Mr. Al-Imtiaz  <b>Associate Professor &amp; Head Department of CSE</b>  <b>University of Information Technology and Sciences</b>

## Abstract

A Library Management System helps to manage books, track inventory, record borrowing and returns, and organize library operations easily and efficiently. It saves time and reduces manual errors. This project demonstrates the practical implementation of Object-Oriented Programming (OOP) principles, including classes, inheritance, encapsulation, and polymorphism.

## Objectives

In our project, we aimed to create a system suitable for a librarian, fulfilling objects such as...

- ◆ Automate Student Information management processes.
- ◆ Automate book Information management processes.
- ◆ Provide a user-friendly interface for librarians.
- ◆ Maintain member records, book details, and transaction history.
- ◆ Enable secure login for administrators.

## Equipment and Components

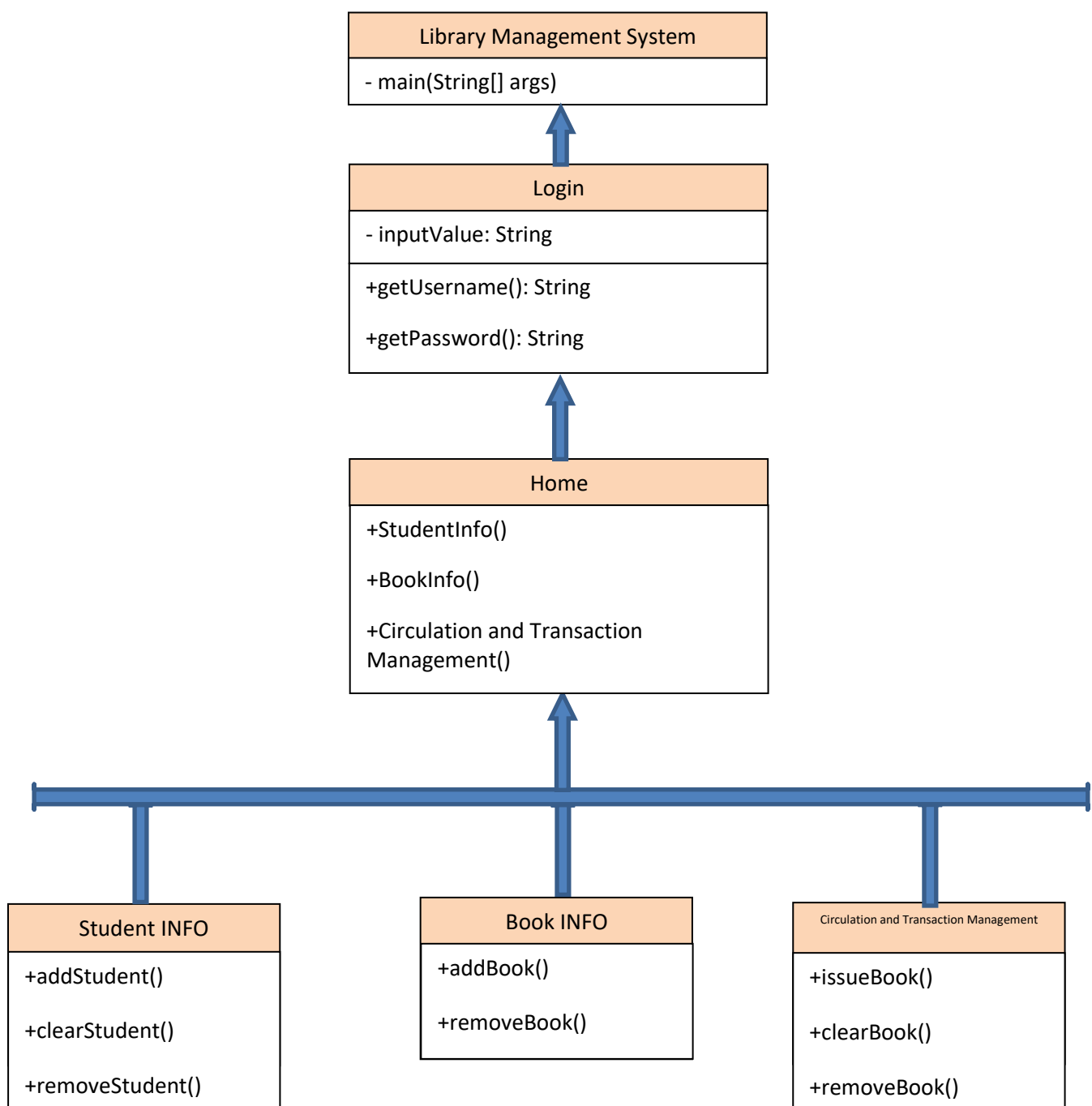
### ➤ Hardware:

- Laptop

## ➤ Software:

- Integrated Development Environment (IDE): NetBeans
- Java Development Kit (JDK)
- Java Swing
- File I/O for data persistence

## Class Diagram



# Theory

The **Library Management System** is built using Java Swing for GUI, implementing the concepts of Object-Oriented Programming (OOP).

## Key Concepts:

### 1) **Classes and Objects:**

- Classes represent entities like Student INFO, Book INFO, and Circulation and Transaction Management.
- Objects are instances of these classes.

### 2) **Inheritance:**

- Used to extend base functionality for specialized entities.

### 3) **Encapsulation:**

- Data is encapsulated within classes with private attributes and public methods for access.

### 4) **Polymorphism:**

- Implemented methods like issuing and returning books.

### 5) **Java Swing:**

- Swing provides GUI components such as JFrame, JPanel, JTextField, JButton, and JTable.

### 6) **File Handling:**

- Data is stored in text files for persistent storage.

# Methodology

## 1. **Requirement Analysis:**

- Identified the basic functionalities like adding Student INFO, Book INFO, and recording transactions.

## 2. **System Design:**

- Designed the class diagram, use cases, and GUI layout.

### 3. **Implementation:**

- Developed the system using Java Swing, separating logic into classes for modularity.

### 4. **Testing:**

- Tested the application for adding Student and Book Info and issuing, and returning books.

### 5. **Deployment:**

- The final application was deployed as a standalone desktop application.

## Code

### login.java

```
package librarymanagementsystem;

import javax.swing.JOptionPane;

public class login extends javax.swing.JFrame {

    public login() {

        initComponents();

        //width and height

        setBounds(300,200,800,400);

    }

    // <editor-fold defaultstate="collapsed" desc="Generated Code">
```

```
private void initComponents() {  
    jLabel4 = new javax.swing.JLabel();  
    jLabel5 = new javax.swing.JLabel();  
    jLabel1 = new javax.swing.JLabel();  
    jLabel2 = new javax.swing.JLabel();  
    jTextField1 = new javax.swing.JTextField();  
    jPasswordField1 = new javax.swing.JPasswordField();  
    jButton3 = new javax.swing.JButton();  
    jLabel3 = new javax.swing.JLabel();  
    jButton4 = new javax.swing.JButton();  
    jLabel7 = new javax.swing.JLabel();  
    jLabel4.setText("jLabel4");  
    jLabel5.setText("jLabel5");  
    setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);  
    setTitle("Welcome to Library!");  
    setBackground(new java.awt.Color(51, 255, 153));  
    getContentPane().setLayout(null);  
    jLabel1.setFont(new java.awt.Font("Arial Rounded MT Bold", 0, 14)); // NOI18N  
    jLabel1.setText("Password:");  
    getContentPane().add(jLabel1);  
    jLabel1.setBounds(133, 159, 107, 25);  
    jLabel2.setFont(new java.awt.Font("Arial Rounded MT Bold", 0, 14)); // NOI18N  
    jLabel2.setText("Username: ");  
    getContentPane().add(jLabel2);  
    jLabel2.setBounds(133, 116, 107, 25);  
    jTextField1.setBackground(new java.awt.Color(255, 204, 204));  
    jTextField1.setFont(new java.awt.Font("Arial", 0, 14)); // NOI18N  
    jTextField1.addActionListener(new java.awt.event.ActionListener() {
```

```

        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jTextField1ActionPerformed(evt);
        }
    });

    getContentPane().add(jTextField1);

    jTextField1.setBounds(313, 118, 270, 23);

    jPasswordField1.setBackground(new java.awt.Color(204, 204, 255));

    jPasswordField1.setFont(new java.awt.Font("Arial", 0, 14)); // NOI18N
    jPasswordField1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jPasswordField1ActionPerformed(evt);
        }
    });

    getContentPane().add(jPasswordField1);

    jPasswordField1.setBounds(313, 161, 270, 23);


    jButton3.setBackground(new java.awt.Color(255, 204, 204));

    jButton3.setFont(new java.awt.Font("Arial Black", 0, 12)); // NOI18N
    jButton3.setText("Login");

    jButton3.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButton3ActionPerformed(evt);
        }
    });

    getContentPane().add(jButton3);

    jButton3.setBounds(260, 240, 133, 25);

    jLabel3.setFont(new java.awt.Font("Yu Gothic UI Semilight", 1, 24)); // NOI18N
    jLabel3.setForeground(new java.awt.Color(0, 51, 51));

```

```

jLabel3.setText(" WelCome to the Library!");

jLabel3.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));

getContentPane().add(jLabel3);

jLabel3.setBounds(210, 20, 375, 34);

jButton4.setBackground(new java.awt.Color(255, 204, 204));

jButton4.setFont(new java.awt.Font("Arial Black", 0, 12)); // NOI18N

jButton4.setText("Back");

jButton4.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton4ActionPerformed(evt);

    }

});

getContentPane().add(jButton4);

jButton4.setBounds(500, 240, 133, 25);


jLabel7.setIcon(new
javax.swing.ImageIcon("C:\\Users\\Omar\\OneDrive\\Pictures\\Icon\\main3.png")); // NOI18N

getContentPane().add(jLabel7);

jLabel7.setBounds(-140, -20, 1170, 460);

pack();

} // </editor-fold>

private void jTextField1ActionPerformed(java.awt.event.ActionEvent evt) {

}

private void jPasswordField1ActionPerformed(java.awt.event.ActionEvent evt) {

}

private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {

    if(jTextField1.getText().equals("Admin") && jPasswordField1.getText().equals("pass")){

        setVisible(false);
    }
}

```



```
        new home().setVisible(true);
    }

    else{

        JOptionPane.showMessageDialog(null,"Invalid Username or Password!", "Warning",
JOptionPane.ERROR_MESSAGE);

    }

}

private void jButton4ActionPerformed(java.awt.event.ActionEvent evt) {

    System.exit(0);

}

public static void main(String args[]) {

    java.awt.EventQueue.invokeLater(new Runnable() {

        @Override

        public void run() {

            new login().setVisible(true);

        }

    });

}

// Variables declaration - do not modify

private javax.swing.JButton jButton3;

private javax.swing.JButton jButton4;

private javax.swing.JLabel jLabel1;

private javax.swing.JLabel jLabel2;

private javax.swing.JLabel jLabel3;

private javax.swing.JLabel jLabel4;

private javax.swing.JLabel jLabel5;

private javax.swing.JLabel jLabel7;

private javax.swing.JPasswordField jPasswordField1;
```

```
private javax.swing.JTextField jTextField1;  
  
// End of variables declaration  
  
}
```

## home.java

```
package librarymanagementsystem;  
  
import javax.swing.JFrame;  
  
import javax.swing.JOptionPane;  
  
public class home extends javax.swing.JFrame {  
  
    public home() {  
  
        initComponents();  
  
        //FULL Screen  
  
        setExtendedState(JFrame.MAXIMIZED_BOTH);  
  
    }  
  
    // <editor-fold defaultstate="collapsed" desc="Generated Code">  
  
    private void initComponents() {  
  
        jLabel2 = new javax.swing.JLabel();  
  
        jLabel1 = new javax.swing.JLabel();  
  
        jButton1 = new javax.swing.JButton();  
  
        jButton2 = new javax.swing.JButton();  
  
        jButton3 = new javax.swing.JButton();  
  
        jButton4 = new javax.swing.JButton();  
  
        jButton5 = new javax.swing.JButton();  
  
        jButton7 = new javax.swing.JButton();  
  
        jLabel3 = new javax.swing.JLabel();  
  
        jLabel2.setText("jLabel2");  
  
        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);  
  
        getContentPane().setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
```

```

jLabel1.setBackground(new java.awt.Color(153, 153, 255));

jLabel1.setFont(new java.awt.Font("Segoe UI Black", 0, 36)); // NOI18N

jLabel1.setForeground(new java.awt.Color(0, 51, 51));

jLabel1.setText(" Home Page ");

jLabel1.setVerticalAlignment(javax.swing.SwingConstants.TOP);

jLabel1.setBorder(new javax.swing.border.MatteBorder(null));

getContentPane().add(jLabel1, new org.netbeans.lib.awtextra.AbsoluteConstraints(550, 50, -1,
52));

jButton1.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N

jButton1.setText("Book INFO");

jButton1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0),
2));

jButton1.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton1ActionPerformed(evt);

    }

});

getContentPane().add(jButton1, new org.netbeans.lib.awtextra.AbsoluteConstraints(390, 320,
570, -1));


jButton2.setText("Book INFO");

getContentPane().add(jButton2, new org.netbeans.lib.awtextra.AbsoluteConstraints(96, 208, -1,
0));


jButton3.setText("Book INFO");

getContentPane().add(jButton3, new org.netbeans.lib.awtextra.AbsoluteConstraints(106, 218, -
1, 0));


jButton4.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N

jButton4.setText("Circulation and Transaction Management");

```

```
jButton4.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0),
2));

jButton4.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton4ActionPerformed(evt);

    }

});

getContentPane().add(jButton4, new org.netbeans.lib.awtextra.AbsoluteConstraints(390, 450,
570, -1));
```

```
jButton5.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N

jButton5.setText("Student INFO");

jButton5.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0),
2));

jButton5.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton5ActionPerformed(evt);

    }

});

getContentPane().add(jButton5, new org.netbeans.lib.awtextra.AbsoluteConstraints(390, 200,
570, -1));
```

```
jButton7.setBackground(new java.awt.Color(255, 255, 204));

jButton7.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N

jButton7.setText("Log Out");

jButton7.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0),
2));

jButton7.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton7ActionPerformed(evt);

    }

});
```

```

        }

    });

    getContentPane().add(jButton7, new org.netbeans.lib.awtextra.AbsoluteConstraints(1100, 600,
110, -1));

    jLabel3.setIcon(new
javax.swing.ImageIcon("C:\\Users\\Omar\\OneDrive\\Pictures\\Icon\\main.png")); // NOI18N

    getContentPane().add(jLabel3, new org.netbeans.lib.awtextra.AbsoluteConstraints(-320, -80,
1670, 1180));

    pack();
} // </editor-fold>

private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
    setVisible(false);

    bookInfo b= new bookInfo();

    b.setVisible(true);
}

private void jButton7ActionPerformed(java.awt.event.ActionEvent evt) {
    int response = JOptionPane.showConfirmDialog(null,"Do you want to Log
Out?","Notification",JOptionPane.YES_NO_OPTION);

    if(response == JOptionPane.YES_OPTION){
        setVisible(false);

        new login().setVisible(true);
    }
    else{
        System.out.println("Logout canceled.");
    }
}

```

```
private void jButton4ActionPerformed(java.awt.event.ActionEvent evt) {  
    setVisible(false);  
    management m= new management();  
    m.setVisible(true);  
}
```

```
private void jButton5ActionPerformed(java.awt.event.ActionEvent evt) {  
    setVisible(false);  
    studentInfo s= new studentInfo();  
    s.setVisible(true);  
}
```

```
public static void main(String args[]) {  
    java.awt.EventQueue.invokeLater(new Runnable() {  
        @Override  
        public void run() {  
            new home().setVisible(true);  
        }  
    });  
}
```

// Variables declaration - do not modify

```
private javax.swing.JButton jButton1;  
private javax.swing.JButton jButton2;  
private javax.swing.JButton jButton3;  
private javax.swing.JButton jButton4;  
private javax.swing.JButton jButton5;
```

```
private javax.swing.JButton jButton7;

private javax.swing.JLabel jLabel1;

private javax.swing.JLabel jLabel2;

private javax.swing.JLabel jLabel3;

// End of variables declaration

}
```

## StudentInfo.java

```
package librarymanagementsystem;

import javax.swing.JFrame;

import javax.swing.JOptionPane;

import javax.swing.table.DefaultTableModel;

public class studentInfo extends javax.swing.JFrame {

    public studentInfo() {

        initComponents();

        //FULL Screen

        setExtendedState(JFrame.MAXIMIZED_BOTH);

    }

    @SuppressWarnings("unchecked")

    // <editor-fold defaultstate="collapsed" desc="Generated Code">

    private void initComponents() {

        jLabel1 = new javax.swing.JLabel();

        jButton7 = new javax.swing.JButton();

        jScrollPane1 = new javax.swing.JScrollPane();

        jTable1 = new javax.swing.JTable();

        jLabel2 = new javax.swing.JLabel();
```

```
jLabel3 = new javax.swing.JLabel();
jLabel4 = new javax.swing.JLabel();
jLabel5 = new javax.swing.JLabel();
jLabel6 = new javax.swing.JLabel();
SaveButton = new javax.swing.JButton();
txtID = new javax.swing.JTextField();
txtName = new javax.swing.JTextField();
cmbDpt = new javax.swing.JComboBox<>();
txtBatch = new javax.swing.JTextField();
txtContact = new javax.swing.JTextField();
removeButton = new javax.swing.JButton();
ClearButton = new javax.swing.JButton();
jLabel7 = new javax.swing.JLabel();

setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);
getContentPane().setLayout(null);

jLabel1.setBackground(new java.awt.Color(255, 204, 204));
jLabel1.setFont(new java.awt.Font("Segoe UI Black", 0, 36)); // NOI18N
jLabel1.setForeground(new java.awt.Color(0, 51, 51));
jLabel1.setText(" Student Info");
jLabel1.setBorder(new javax.swing.border.MatteBorder(null));
getContentPane().add(jLabel1);
jLabel1.setBounds(500, 20, 270, 52);

jButton7.setBackground(new java.awt.Color(255, 255, 204));
jButton7.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N
jButton7.setText("Back");
```



```

jButton7.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
jButton7.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton7ActionPerformed(evt);
    }
});
getContentPane().add(jButton7);
jButton7.setBounds(1180, 610, 90, 28);

jTable1.setAutoCreateRowSorter(true);
jTable1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
jTable1.setModel(new javax.swing.table.DefaultTableModel(
    new Object [][] {

    },
    new String [] {
        "Student ID", "Student Name", "Department", "Batch", "Contact Number"
    }
) {
    Class[] types = new Class [] {
        java.lang.Integer.class, java.lang.String.class, java.lang.Object.class,
        java.lang.Integer.class, java.lang.Long.class
    };

    public Class getColumnClass(int columnIndex) {
        return types [columnIndex];
    }
});

```

```
jTable1.setAutoscrolls(false);  
jScrollPane1.setViewportView(jTable1);
```

```
getContentPane().add(jScrollPane1);  
jScrollPane1.setBounds(490, 120, 793, 453);
```

```
jLabel2.setText("Student ID: ");  
getContentPane().add(jLabel2);  
jLabel2.setBounds(40, 125, 100, 16);
```

```
jLabel3.setText("Name: ");  
getContentPane().add(jLabel3);  
jLabel3.setBounds(40, 210, 100, 16);
```

```
jLabel4.setText("Department:");  
getContentPane().add(jLabel4);  
jLabel4.setBounds(40, 291, 110, 16);
```

```
jLabel5.setText("Batch: ");  
getContentPane().add(jLabel5);  
jLabel5.setBounds(40, 350, 90, 16);
```

```
jLabel6.setText("Contact Number: ");  
getContentPane().add(jLabel6);  
jLabel6.setBounds(40, 421, 110, 16);
```

```
SaveButton.setBackground(new java.awt.Color(204, 204, 255));  
SaveButton.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N
```

```
SaveButton.setText("Save");

SaveButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));

SaveButton.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        SaveButtonActionPerformed(evt);

    }

});

getContentPane().add(SaveButton);

SaveButton.setBounds(40, 510, 109, 28);

getContentPane().add(txtID);

txtID.setBounds(153, 122, 299, 22);

getContentPane().add(txtName);

txtName.setBounds(153, 207, 299, 22);


cmbDpt.setModel(new javax.swing.DefaultComboBoxModel<>(new String[] { "CSE", "IT", "EEE", "CE", "Pharmacy", "BBA", "LLB" }));

cmbDpt.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        cmbDptActionPerformed(evt);

    }

});

getContentPane().add(cmbDpt);

cmbDpt.setBounds(153, 288, 299, 22);

getContentPane().add(txtBatch);

txtBatch.setBounds(153, 347, 299, 22);

getContentPane().add(txtContact);

txtContact.setBounds(153, 418, 299, 22);
```

```
removeButton.setBackground(new java.awt.Color(204, 204, 255));

removeButton.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N

removeButton.setText("Remove");

removeButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));

removeButton.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        removeButtonActionPerformed(evt);

    }

});

getContentPane().add(removeButton);

removeButton.setBounds(340, 510, 120, 28);
```

```
ClearButton.setBackground(new java.awt.Color(204, 204, 255));

ClearButton.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N

ClearButton.setText("Clear");

ClearButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));

ClearButton.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        ClearButtonActionPerformed(evt);

    }

});

getContentPane().add(ClearButton);

ClearButton.setBounds(190, 510, 110, 28);
```

```
jLabel7.setIcon(new
javax.swing.ImageIcon("C:\\Users\\Omar\\OneDrive\\Pictures\\Icon\\main2.png")); // NOI18N
```

```
getContentPane().add(jLabel7);
```

```
jLabel7.setBounds(-350, -110, 1730, 1280);
```

```
pack();
```

```
// </editor-fold>
```

```
private void jButton7ActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    setVisible(false);
```

```
    home h= new home();
```

```
    h.setVisible(true);
```

```
}
```

```
public static void addRowToJTable(Object[] dataRow){
```

```
    DefaultTableModel model= (DefaultTableModel)jTable1.getModel();
```

```
    model.addRow(dataRow);
```

```
}
```

```
private void SaveButtonActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    if( txtID.getText().equals("") || txtName.getText().equals("") || txtBatch.getText().equals("") ||  
txtContact.getText().equals("")){
```

```
        JOptionPane.showMessageDialog(null,"Incomplete INFO!", "Warning",  
JOptionPane.ERROR_MESSAGE);
```

```
    }
```

```
    else{
```

```
        String data[]={ txtID.getText(), txtName.getText(),(String)cmbDpt.getSelectedItem(),  
txtBatch.getText(), txtContact.getText()};
```

```
        DefaultTableModel tblModel= (DefaultTableModel)jTable1.getModel();
```

```
        tblModel.addRow(data);
```

```
        JOptionPane.showMessageDialog(null,"Student Added Successfully!", "Notification",  
JOptionPane.INFORMATION_MESSAGE);
```

```
    }
```

```
}
```

```
private void cmbDptActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    // TODO add your handling code here:
```

```
}
```

```
private void removeButtonActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    DefaultTableModel tblModel = (DefaultTableModel) jTable1.getModel();
```

```
    if(jTable1.getSelectedRowCount() == 1){
```

```
        tblModel.removeRow(jTable1.getSelectedRow());
```

```
        JOptionPane.showMessageDialog(null,"Student Removed Successfully!", "Notification",  
JOptionPane.INFORMATION_MESSAGE);
```

```
    }
```

```
    else if(jTable1.getSelectedRowCount() == 0){
```

```
        JOptionPane.showMessageDialog(null,"Please select a row to remove!", "Notification",  
JOptionPane.INFORMATION_MESSAGE);
```

```
    }
```

```
    else{
```

```
        JOptionPane.showMessageDialog(null,"Please select a row to remove!", "Notification",  
JOptionPane.INFORMATION_MESSAGE);
```

```
    }
```

```
}
```

```
private void ClearButtonActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    txtID.setText(null);
```

```
    txtName.setText(null);
```

```
    txtBatch.setText(null);
```

```
    txtContact.setText(null);
```

```
}
```

```
public static void main(String args[]) {  
  
    java.awt.EventQueue.invokeLater(new Runnable() {  
        @Override  
        public void run() {  
            new studentInfo().setVisible(true);  
        }  
    });  
}
```

```
// Variables declaration - do not modify  
private javax.swing.JButton ClearButton;  
private javax.swing.JButton SaveButton;  
private javax.swing.JComboBox<String> cmbDpt;  
private javax.swing.JButton jButton7;  
private javax.swing.JLabel jLabel1;  
private javax.swing.JLabel jLabel2;  
private javax.swing.JLabel jLabel3;  
private javax.swing.JLabel jLabel4;  
private javax.swing.JLabel jLabel5;  
private javax.swing.JLabel jLabel6;  
private javax.swing.JLabel jLabel7;  
private javax.swing.JScrollPane jScrollPane1;  
public static javax.swing.JTable jTable1;  
private javax.swing.JButton removeButton;  
private javax.swing.JTextField txtBatch;
```

```
private javax.swing.JTextField txtContact;

private javax.swing.JTextField txtID;

private javax.swing.JTextField txtName;

// End of variables declaration

}
```

## **bookInfo.java**

```
package librarymanagementsystem;

import javax.swing.JFrame;

import javax.swing.JOptionPane;

import javax.swing.table.DefaultTableModel;

import static librarymanagementsystem.studentInfo.jTable1;
```

```
public class bookInfo extends javax.swing.JFrame {
```

```
    public bookInfo() {
        initComponents();
        //FULL Screen
        setExtendedState(JFrame.MAXIMIZED_BOTH);
    }
```

```
@SuppressWarnings("unchecked")
```

```
// <editor-fold defaultstate="collapsed" desc="Generated Code">
```

```
private void initComponents() {
```



```
jLabel1 = new javax.swing.JLabel();
jButton7 = new javax.swing.JButton();
jScrollPane1 = new javax.swing.JScrollPane();
jTable1 = new javax.swing.JTable();
jLabel3 = new javax.swing.JLabel();
txt2 = new javax.swing.JTextField();
jLabel4 = new javax.swing.JLabel();
txt3 = new javax.swing.JTextField();
jLabel5 = new javax.swing.JLabel();
txt5 = new javax.swing.JTextField();
jLabel6 = new javax.swing.JLabel();
combo1 = new javax.swing.JComboBox<>();
jButton8 = new javax.swing.JButton();
jLabel7 = new javax.swing.JLabel();
txt4 = new javax.swing.JTextField();
ClearButton = new javax.swing.JButton();
jLabel2 = new javax.swing.JLabel();

setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);
getContentPane().setLayout(null);

jLabel1.setBackground(new java.awt.Color(153, 153, 255));
jLabel1.setFont(new java.awt.Font("Segoe UI Black", 0, 36)); // NOI18N
jLabel1.setForeground(new java.awt.Color(0, 51, 51));
jLabel1.setText(" Book Info ");
jLabel1.setBorder(new javax.swing.border.MatteBorder(null));
getContentPane().add(jLabel1);
jLabel1.setBounds(550, 40, 230, 52);
```

```

jButton7.setBackground(new java.awt.Color(255, 255, 204));

jButton7.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N
jButton7.setText("Back");

jButton7.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));

jButton7.addActionListener(new java.awt.event.ActionListener() {

    public void actionPerformed(java.awt.event.ActionEvent evt) {

        jButton7ActionPerformed(evt);

    }

});

getContentPane().add(jButton7);

jButton7.setBounds(1150, 640, 110, 33);


jTable1.setModel(new javax.swing.table.DefaultTableModel(

    new Object [][] {

        },

    new String [] {

        "Book ID", "Book Title", "Author", "Genre", "No. of Books"

    }

));

jScrollPane1.setViewportView(jTable1);


getContentPane().add(jScrollPane1);

jScrollPane1.setBounds(600, 160, 660, 402);


jLabel3.setText("Book ID: ");

getContentPane().add(jLabel3);

```

```
jLabel3.setBounds(74, 175, 110, 16);
```

```
txt2.addActionListener(new java.awt.event.ActionListener() {  
    public void actionPerformed(java.awt.event.ActionEvent evt) {  
        txt2ActionPerformed(evt);  
    }  
});
```

```
getContentPane().add(txt2);
```

```
txt2.setBounds(202, 172, 339, 22);
```

```
jLabel4.setText("Book Title: ");
```

```
getContentPane().add(jLabel4);
```

```
jLabel4.setBounds(74, 247, 110, 16);
```

```
getContentPane().add(txt3);
```

```
txt3.setBounds(202, 244, 339, 22);
```

```
jLabel5.setText("Author: ");
```

```
getContentPane().add(jLabel5);
```

```
jLabel5.setBounds(74, 337, 110, 16);
```

```
getContentPane().add(txt5);
```

```
txt5.setBounds(202, 501, 339, 22);
```

```
jLabel6.setText("Genre:");
```

```
getContentPane().add(jLabel6);
```

```
jLabel6.setBounds(74, 418, 110, 16);
```

```
combo1.setModel(new javax.swing.DefaultComboBoxModel<>(new String[] { "Fantasy",  
"Science Fiction", "Mystery", "Romance", "Historical Fiction", "Adventure" }));
```

```
getContentPane().add(combo1);  
combo1.setBounds(202, 415, 339, 22);
```

```
jButton8.setBackground(new java.awt.Color(204, 204, 255));  
jButton8.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N  
jButton8.setText("Save");  
jButton8.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));  
jButton8.addActionListener(new java.awt.event.ActionListener() {  
    public void actionPerformed(java.awt.event.ActionEvent evt) {  
        jButton8ActionPerformed(evt);  
    }  
});  
getContentPane().add(jButton8);  
jButton8.setBounds(62, 563, 145, 23);
```

```
jLabel7.setText("No. of Books:");  
getContentPane().add(jLabel7);  
jLabel7.setBounds(74, 504, 100, 16);  
getContentPane().add(txt4);  
txt4.setBounds(202, 334, 339, 22);
```

```
ClearButton.setBackground(new java.awt.Color(204, 204, 255));  
ClearButton.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N  
ClearButton.setText("Clear");  
ClearButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0,  
0)));  
ClearButton.addActionListener(new java.awt.event.ActionListener() {  
    public void actionPerformed(java.awt.event.ActionEvent evt) {
```

```

        ClearButtonActionPerformed(evt);
    }
});

getContentPane().add(ClearButton);

ClearButton.setBounds(349, 563, 145, 23);

jLabel2.setIcon(new
javax.swing.ImageIcon("C:\\Users\\Omar\\OneDrive\\Pictures\\Icon\\main2.png")); // NOI18N

getContentPane().add(jLabel2);

jLabel2.setBounds(-350, -40, 2000, 1190);

pack();
} // </editor-fold>

private void jButton7ActionPerformed(java.awt.event.ActionEvent evt) {
    setVisible(false);

    home h= new home();

    h.setVisible(true);
}

private void txt2ActionPerformed(java.awt.event.ActionEvent evt) {

}

private void jButton8ActionPerformed(java.awt.event.ActionEvent evt) {

    if(txt2.getText().equals("") || txt3.getText().equals("")|| txt4.getText().equals("")||
txt5.getText().equals("")){

        JOptionPane.showMessageDialog(null,"Incomplete INFO!", "Warning",
JOptionPane.ERROR_MESSAGE);
    }
}

```

```

    }

    else{

        String data[]= {txt2.getText(), txt3.getText(), txt4.getText(),
(String)combo1.getSelectedItem(),txt5.getText()};

        DefaultTableModel tblModel= (DefaultTableModel)jTable1.getModel();

        tblModel.addRow(data);

        JOptionPane.showMessageDialog(null,"Book Added Successfully!", "Notification",
JOptionPane.INFORMATION_MESSAGE);

    }

}

private void ClearButtonActionPerformed(java.awt.event.ActionEvent evt) {

    txt2.setText(null);

    txt3.setText(null);

    txt4.setText(null);

    txt5.setText(null);

}

public static void main(String args[]) {

    java.awt.EventQueue.invokeLater(new Runnable() {

        @Override

        public void run() {

            new bookInfo().setVisible(true);

        }

    });

}

```

```
// Variables declaration - do not modify

private javax.swing.JButton ClearButton;

private javax.swing.JComboBox<String> combo1;

private javax.swing.JButton jButton7;

private javax.swing.JButton jButton8;

private javax.swing.JLabel jLabel1;

private javax.swing.JLabel jLabel2;

private javax.swing.JLabel jLabel3;

private javax.swing.JLabel jLabel4;

private javax.swing.JLabel jLabel5;

private javax.swing.JLabel jLabel6;

private javax.swing.JLabel jLabel7;

private javax.swing.JScrollPane jScrollPane1;

private javax.swing.JTable jTable1;

private javax.swing.JTextField txt2;

private javax.swing.JTextField txt3;

private javax.swing.JTextField txt4;

private javax.swing.JTextField txt5;

// End of variables declaration
}
```

## **management.java**

```
package librarymanagementsystem;

import java.text.SimpleDateFormat;

import javax.swing.JFrame;

import javax.swing.JOptionPane;

import javax.swing.table.DefaultTableModel;

import static librarymanagementsystem.studentInfo.jTable1;
```

```
public class management extends javax.swing.JFrame {

    public management() {

        initComponents();

        //FULL Screen

        setExtendedState(JFrame.MAXIMIZED_BOTH);

    }

    @SuppressWarnings("unchecked")
    // <editor-fold defaultstate="collapsed" desc="Generated Code">
    private void initComponents() {

        jLabel1 = new javax.swing.JLabel();
        jButton7 = new javax.swing.JButton();
        issueButton = new javax.swing.JButton();
        returnButton = new javax.swing.JButton();
        jLabel2 = new javax.swing.JLabel();
        jLabel3 = new javax.swing.JLabel();
        jLabel4 = new javax.swing.JLabel();
        jLabel5 = new javax.swing.JLabel();
        jLabel6 = new javax.swing.JLabel();
        jLabel7 = new javax.swing.JLabel();
        txt1 = new javax.swing.JTextField();
        txt2 = new javax.swing.JTextField();
        txt3 = new javax.swing.JTextField();
        txt4 = new javax.swing.JTextField();
        dateChooser1 = new com.toedter.calendar.JDateChooser();
        dateChooser2 = new com.toedter.calendar.JDateChooser();
        jScrollPane1 = new javax.swing.JScrollPane();
```



```

jTable1 = new javax.swing.JTable();

clearButton = new javax.swing.JButton();

jLabel9 = new javax.swing.JLabel();


setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

getContentPane().setLayout(null);


jLabel1.setBackground(new java.awt.Color(153, 153, 255));
jLabel1.setFont(new java.awt.Font("Segoe UI Black", 0, 36)); // NOI18N
jLabel1.setForeground(new java.awt.Color(0, 51, 51));
jLabel1.setText(" Circulation and Transaction Management ");
jLabel1.setBorder(new javax.swing.border.MatteBorder(null));
getContentPane().add(jLabel1);
jLabel1.setBounds(290, 40, 850, 52);


jButton7.setBackground(new java.awt.Color(255, 255, 204));
jButton7.setFont(new java.awt.Font("Arial Black", 0, 18)); // NOI18N
jButton7.setText("Back");
jButton7.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
jButton7.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton7ActionPerformed(evt);
    }
});

getContentPane().add(jButton7);
jButton7.setBounds(1210, 610, 90, 28);


issueButton.setBackground(new java.awt.Color(204, 204, 255));

```

```
issueButton.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N
issueButton.setText("Issue Book");
issueButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
issueButton.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        issueButtonActionPerformed(evt);
    }
});
getContentPane().add(issueButton);
issueButton.setBounds(81, 475, 200, 30);

returnButton.setBackground(new java.awt.Color(204, 204, 255));
returnButton.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N
returnButton.setText("Return Book");
returnButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
returnButton.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        returnButtonActionPerformed(evt);
    }
});
getContentPane().add(returnButton);
returnButton.setBounds(81, 534, 200, 30);

jLabel2.setText("Student ID: ");
getContentPane().add(jLabel2);
jLabel2.setBounds(31, 161, 110, 16);
```

```
jLabel3.setText("Student Name: ");  
getContentPane().add(jLabel3);  
jLabel3.setBounds(31, 224, 130, 16);
```

```
jLabel4.setText("Book ID: ");  
getContentPane().add(jLabel4);  
jLabel4.setBounds(31, 275, 110, 16);
```

```
jLabel5.setText("Book Name:");  
getContentPane().add(jLabel5);  
jLabel5.setBounds(31, 306, 130, 16);
```

```
jLabel6.setText("Return Date: ");  
getContentPane().add(jLabel6);  
jLabel6.setBounds(31, 408, 130, 16);
```

```
jLabel7.setText("Issue Date: ");  
getContentPane().add(jLabel7);  
jLabel7.setBounds(31, 372, 140, 16);  
getContentPane().add(txt1);  
txt1.setBounds(199, 158, 243, 22);  
getContentPane().add(txt2);  
txt2.setBounds(199, 221, 243, 22);
```

```
txt3.addActionListener(new java.awt.event.ActionListener() {  
    public void actionPerformed(java.awt.event.ActionEvent evt) {  
        txt3ActionPerformed(evt);
```

```

    }
});

getContentPane().add(txt3);

txt3.setBounds(199, 272, 243, 22);

getContentPane().add(txt4);

txt4.setBounds(199, 303, 243, 22);

getContentPane().add(dateChooser1);

dateChooser1.setBounds(199, 366, 243, 22);

getContentPane().add(dateChooser2);

dateChooser2.setBounds(199, 402, 243, 22);


jTable1.setModel(new javax.swing.table.DefaultTableModel(
    new Object [][] {

    },
    new String [] {
        "Student ID", "Student Name", "Book ID", "Book Name", "Issue Date", "Return Date"
    }
));

jScrollPane1.setViewportViewView(jTable1);


getContentPane().add(jScrollPane1);

jScrollPane1.setBounds(510, 150, 800, 400);


clearButton.setBackground(new java.awt.Color(204, 204, 255));

clearButton.setFont(new java.awt.Font("Segoe UI", 1, 24)); // NOI18N

clearButton.setText("Clear");

```

```
clearButton.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
```

```
clearButton.addActionListener(new java.awt.event.ActionListener() {
```

```
    public void actionPerformed(java.awt.event.ActionEvent evt) {
```

```
        clearButtonActionPerformed(evt);
```

```
    }
```

```
});
```

```
getContentPane().add(clearButton);
```

```
clearButton.setBounds(80, 590, 200, 30);
```

```
jLabel9.setIcon(new  
javax.swing.ImageIcon("C:\\Users\\Omar\\OneDrive\\Pictures\\Icon\\main2.png")); // NOI18N
```

```
getContentPane().add(jLabel9);
```

```
jLabel9.setBounds(-10, 0, 1380, 830);
```

```
pack();
```

```
}// </editor-fold>
```

```
private void jButton7ActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    setVisible(false);
```

```
    home h= new home();
```

```
    h.setVisible(true);
```

```
}
```

```
private void jButtonActionPerformed(java.awt.event.ActionEvent evt) {
```

```
    if( txt1.getText().equals("") || txt2.getText().equals("") || txt3.getText().equals("") ||  
txt4.getText().equals("")){
```

```
        JOptionPane.showMessageDialog(null,"Incomplete INFO!", "Warning",  
JOptionPane.ERROR_MESSAGE);
```

```

    }
else{
    SimpleDateFormat dFormat= new SimpleDateFormat("dd-MM-yyyy");

    String issuDate= dFormat.format(dateChooser1.getDate());

    String dueDate= dFormat.format(dateChooser2.getDate());

    String data[]={ txt1.getText(), txt2.getText(), txt3.getText(), txt4.getText(), issuDate,
dueDate};

    DefaultTableModel tblModel= (DefaultTableModel)jTable1.getModel();

    tblModel.addRow(data);

    JOptionPane.showMessageDialog(null,"Information Added Successfully!", "Notification",
JOptionPane.INFORMATION_MESSAGE);

    }
}

private void returnButtonActionPerformed(java.awt.event.ActionEvent evt) {

    DefaultTableModel tblModel = (DefaultTableModel) jTable1.getModel();

    if(jTable1.getSelectedRowCount() == 1){

        tblModel.removeRow(jTable1.getSelectedRow());

        JOptionPane.showMessageDialog(null,"Book Returned Successfully!", "Notification",
JOptionPane.INFORMATION_MESSAGE);

    }

    else if(jTable1.getSelectedRowCount() == 0){

        JOptionPane.showMessageDialog(null,"Please select a row to Return!", "Notification",
JOptionPane.INFORMATION_MESSAGE);

    }

    else{

        JOptionPane.showMessageDialog(null,"Please select a row to Return!", "Notification",
JOptionPane.INFORMATION_MESSAGE);

    }

}
}

```

```
private void txt3ActionPerformed(java.awt.event.ActionEvent evt) {  
    // TODO add your handling code here:  
}  
  
private void clearButtonActionPerformed(java.awt.event.ActionEvent evt) {  
    txt1.setText(null);  
    txt2.setText(null);  
    txt3.setText(null);  
    txt4.setText(null);  
    dateChooser1.setDate(null);  
    dateChooser2.setDate(null);  
}  
  
public static void main(String args[]) {  
    java.awt.EventQueue.invokeLater(() -> {  
        new management().setVisible(true);  
    });  
}  
  
// Variables declaration - do not modify  
  
private javax.swing.JButton clearButton;  
  
private com.toedter.calendar.JDateChooser dateChooser1;  
  
private com.toedter.calendar.JDateChooser dateChooser2;  
  
private javax.swing.JButton issueButton;  
  
private javax.swing.JButton jButton7;  
  
private javax.swing.JLabel jLabel1;  
  
private javax.swing.JLabel jLabel2;  
  
private javax.swing.JLabel jLabel3;  
  
private javax.swing.JLabel jLabel4;
```

```
private javax.swing.JLabel jLabel5;  
private javax.swing.JLabel jLabel6;  
private javax.swing.JLabel jLabel7;  
private javax.swing.JLabel jLabel9;  
private javax.swing.JScrollPane jScrollPane1;  
private javax.swing.JTable jTable1;  
private javax.swing.JButton returnButton;  
private javax.swing.JTextField txt1;  
private javax.swing.JTextField txt2;  
private javax.swing.JTextField txt3;  
private javax.swing.JTextField txt4;  
  
// End of variables declaration  
}
```

## Observations

- The application provides an intuitive GUI using Java Swing.
- Users can successfully add student and book info and issue, and return books.
- Data persistence is achieved using text files for storing books and transactions.

## Results

The Library Management System was successfully implemented. It allows the following functionalities:

- Adding students and book info to the library.
- Managing borrowers and issuing books.
- Returning books and updating availability status.
- Providing a simple graphical user interface for librarians.



## Discussion and Analysis

The project demonstrates the real-world application of OOP principles:

- **Modularity:** The program structure uses separate classes for each entity, making the code reusable and easy to maintain.
- **Encapsulation:** Data is securely stored in private fields with public access methods.
- **File Handling:** Though functional, using databases like MySQL or SQLite can improve performance for larger datasets.
- **GUI Design:** Java Swing was effective for a simple user interface, but modern frameworks like JavaFX or web-based solutions could enhance usability.

## Conclusion

The Library Management System is an efficient application for managing library operations. The project successfully utilized Object-Oriented Programming concepts and Java Swing for GUI development. Future improvements can include integrating a database and enhancing the GUI for a better user experience.

## References

- **Java: The Complete Reference** by Herbert Schildt.
- **Oracle Java Swing Documentation:** <https://docs.oracle.com/javase/tutorial/uiswing/>
- Course Material on Object-Oriented Programming.
- Online Tutorials: YouTube, W3Schools.