Experiment-7

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Branch: B.E-CSE **Section/Group: IOT-640 -A**

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Subject Name: JAVA **Subject Code: 22CSH-359**

1. **Aim:** To develop a Java program that connects to a MySQL database using JDBC and retrieves all records from the Employee table, displaying them in the console.

2. **Objective:** To develop a Java program that connects to a MySQL database using JDBC and retrieves all records from the Employee table, displaying them in the console.

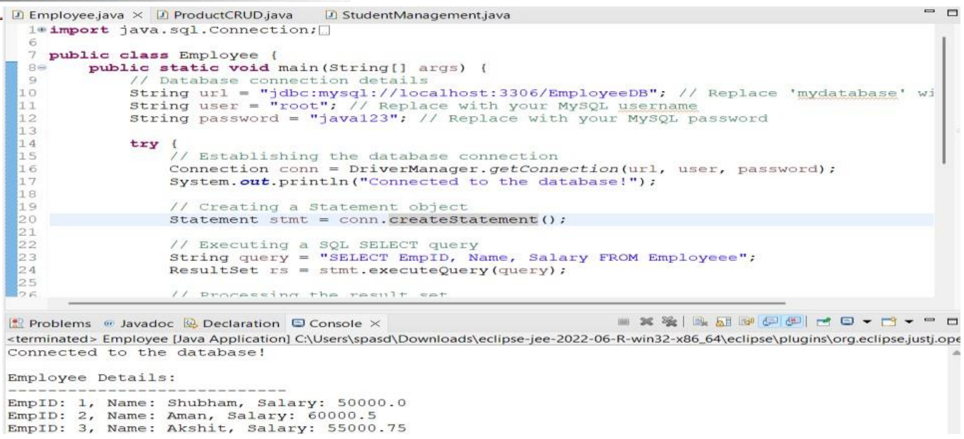
3. **Code:**

```
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;

public class Employee {     public static
void main(String[] args) {
        // Database connection details
        String url = "jdbc:mysql://localhost:3306/EmployeeDB"; // Replace
'mydatabase' with your DB name
        String user = "root"; // Replace with your MySQL username
        String password = "java123"; // Replace with your MySQL password
         try
{
            // Establishing the database connection
            Connection conn = DriverManager.getConnection(url, user, password);
System.out.println("Connected to the database!");

            // Creating a Statement object
            Statement stmt = conn.createStatement();
            //Executing a SQL SELECT query
            String query = "SELECT EmpID, Name, Salary FROM Employeee";
ResultSet rs = stmt.executeQuery(query);

            // Processing the result set
            System.out.println("\nEmployee Details:");



  System.out.println("----------------------------");
while (rs.next()) {               int empID =
rs.getInt("EmpID");                 String name =
rs.getString("Name");                 double salary =
rs.getDouble("Salary");

                System.out.println("EmpID: " + empID + ", Name: " + name + ", Salary: "
+ salary);
            }

            // Closing resources
            rs.close();
stmt.close();
conn.close();
            System.out.println("Connection closed.");
} catch (SQLException e) {
e.printStackTrace();
        }
    }
}
```

//MYSQL CODE:

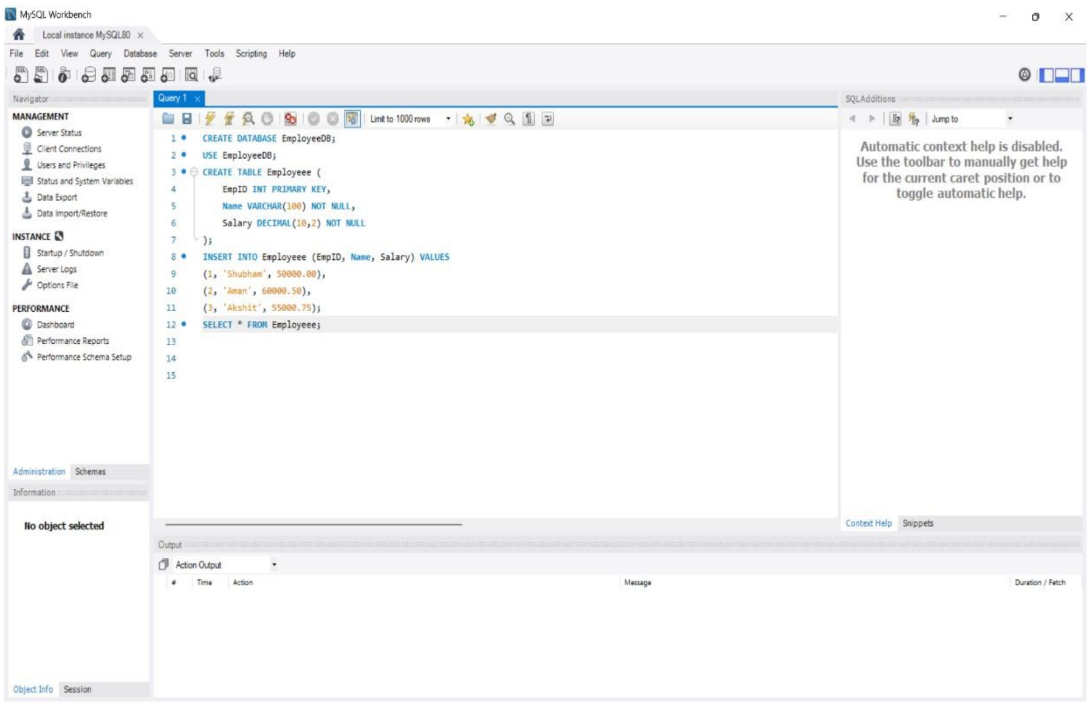
```
CREATE DATABASE EmployeeDB;
USE EmployeeDB;
CREATE TABLE Employeee (EmpID INT PRIMARY KEY,Name
VARCHAR(100)NOT NULL,Salary DECIMAL(10,2) NOT NULL);
INSERT INTO Employeee (EmpID, Name, Salary) VALUES
(1, 'Shubham', 50000.00),
(2, 'Aman', 60000.50),
(3, 'Akshit', 55000.75);
SELECT * FROM Employeee;
```

4. Output:



```java
import java.sql.Connection;

public class Employee {
    public static void main(String[] args) {
        // Database connection details
        String url = "jdbc:mysql://localhost:3306/EmployeeDB"; // Replace 'mydatabase' wi
        String user = "root"; // Replace with your MySQL username
        String password = "java123"; // Replace with your MySQL password

        try {
            // Establishing the database connection
            Connection conn = DriverManager.getConnection(url, user, password);
            System.out.println("Connected to the database!");

            // Creating a Statement object
            Statement stmt = conn.createStatement();

            // Executing a SQL SELECT query
            String query = "SELECT EmpID, Name, Salary FROM Employeee";
            ResultSet rs = stmt.executeQuery(query);

            // Processing the result set
```

```
<terminated> Employee [Java Application] C:\Users\spasd\Downloads\eclipse-jee-2022-06-R-win32-x86_64\eclipse\plugins\org.eclipse.justj.ope
Connected to the database!

Employee Details:
----------------------------
EmpID: 1, Name: Shubham, Salary: 50000.0
EmpID: 2, Name: Aman, Salary: 60000.5
EmpID: 3, Name: Akshit, Salary: 55000.75
```



```sql
CREATE DATABASE EmployeeDB;
USE EmployeeDB;
CREATE TABLE Employeee (
    EmpID INT PRIMARY KEY,
    Name VARCHAR(100) NOT NULL,
    Salary DECIMAL(10,2) NOT NULL
);
INSERT INTO Employeee (EmpID, Name, Salary) VALUES
(1, 'Shubham', 50000.00),
(2, 'Aman', 60000.50),
(3, 'Akshit', 55000.75);
SELECT * FROM Employeee;
```

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

5. Learning Outcomes:

- Learn how to establish a connection between Java and a MySQL database using the DriverManager class.
- Understand how to execute SQL queries using Statement and ResultSet.
- Learn how to perform a SELECT query to retrieve data from a MySQL table.
- Understand how to process the results using ResultSet methods like .getInt(), .getString(), and .getDouble().
- Learn the importance of closing database resources (ResultSet, Statement, Connection) to prevent memory leaks.

Problem 2

1. **Aim:** To develop a Java program that performs CRUD (Create, Read, Update, Delete) operations on a MySQL database table Product, ensuring data integrity using transaction handling.

2. **Objective**: Build a menu-driven Java application that allows users to manage product records in a MySQL database with transactional support.

3. **Code:**

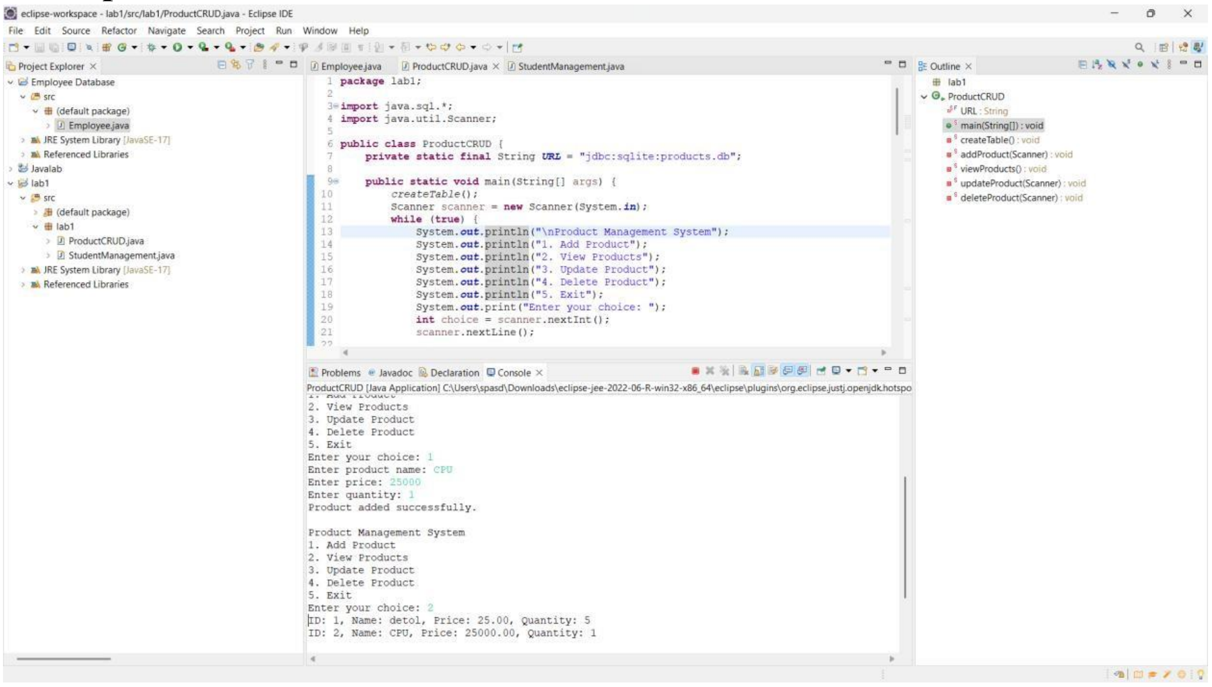
```
    package lab1; import
    java.sql.*; import
    java.util.Scanner;
    public class
    ProductCRUD {
     private static final String URL = "jdbc:sqlite:products.db";
      public static void main(String[] args) {
createTable();
      Scanner scanner = new Scanner(System.in);
while (true) {
        System.out.println("\nProduct Management System");
        System.out.println("Add Product");
        System.out.println("View Products");
        System.out.println("Update Product");
        System.out.println("Delete Product");
        System.out.println("Exit");
        System.out.print("Enter your choice: ");
int choice = scanner.nextInt();
scanner.nextLine();              switch (choice)
{              case 1 -> addProduct(scanner);
case 2 -> viewProducts();              case 3 ->
updateProduct(scanner);              case 4 ->
deleteProduct(scanner);              case 5 -> {
```

```
System.out.println("Exiting...");
scanner.close();                    return;
                }
                default -> System.out.println("Invalid choice. Try again.");
            }
        }
    }
    private static void createTable() {
        String sql = "CREATE TABLE IF NOT EXISTS Product (ProductID INTEGER
PRIMARY KEY AUTOINCREMENT, ProductName TEXT, Price REAL, Quantity
INTEGER)";
        try (Connection conn = DriverManager.getConnection(URL); Statement stmt =
conn.createStatement()) {
            stmt.execute(sql);        }
catch (SQLException e) {
e.printStackTrace();
        }
}
    private static void addProduct(Scanner scanner) {
        System.out.print("Enter product name: ");
        String name = scanner.nextLine();
System.out.print("Enter price: ");
double price = scanner.nextDouble();
System.out.print("Enter quantity: ");
int quantity = scanner.nextInt();
        String sql = "INSERT INTO Product (ProductName, Price, Quantity) VALUES (?,
?, ?)";
        try (Connection conn = DriverManager.getConnection(URL);
PreparedStatement pstmt = conn.prepareStatement(sql)) {            pstmt.setString(1,
name);            pstmt.setDouble(2, price);            pstmt.setInt(3, quantity);
pstmt.executeUpdate();
            System.out.println("Product added successfully.");
} catch (SQLException e) {            e.printStackTrace();
        }
    }
```

```
   private static void viewProducts() {
String sql = "SELECT * FROM Product";
        try (Connection conn = DriverManager.getConnection(URL); Statement stmt =
conn.createStatement(); ResultSet rs = stmt.executeQuery(sql)) {
            while (rs.next()) {
                System.out.printf("ID: %d, Name: %s, Price: %.2f, Quantity: %d\n",
rs.getInt("ProductID"), rs.getString("ProductName"), rs.getDouble("Price"),
rs.getInt("Quantity"));
            }
        } catch (SQLException e) {
e.printStackTrace();


    }}
    private static void updateProduct(Scanner scanner)
{        System.out.print("Enter ProductID to update:
");        int id = scanner.nextInt();
System.out.print("Enter new price: ");        double
price = scanner.nextDouble();
System.out.print("Enter new quantity: ");        int
quantity = scanner.nextInt();
        String sql = "UPDATE Product SET Price = ?, Quantity = ? WHERE ProductID =
?";
        try (Connection conn = DriverManager.getConnection(URL);
PreparedStatement pstmt = conn.prepareStatement(sql)) {            pstmt.setDouble(1,
price);            pstmt.setInt(2, quantity);            pstmt.setInt(3, id);
            int rows = pstmt.executeUpdate();
            System.out.println(rows > 0 ? "Product updated successfully." : "Product not
found.");
        } catch (SQLException e) {
e.printStackTrace();
        }
    }
```

```
private static void deleteProduct(Scanner scanner) {
System.out.print("Enter ProductID to delete: ");
int id = scanner.nextInt();
        String sql = "DELETE FROM Product WHERE ProductID = ?";
        try (Connection conn = DriverManager.getConnection(URL); PreparedStatement
pstmt = conn.prepareStatement(sql)) {
            pstmt.setInt(1, id);
            int rows = pstmt.executeUpdate();
            System.out.println(rows > 0 ? "Product deleted successfully." : "Product not
found.");
        } catch (SQLException e) {
e.printStackTrace();
        }
    }
}
```

4. Output:



```
package lab1;

import java.sql.*;
import java.util.Scanner;

public class ProductCRUD {
    private static final String URL = "jdbc:sqlite:products.db";

    public static void main(String[] args) {
        createTable();
        Scanner scanner = new Scanner(System.in);
        while (true) {
            System.out.println("\nProduct Management System");
            System.out.println("1. Add Product");
            System.out.println("2. View Products");
            System.out.println("3. Update Product");
            System.out.println("4. Delete Product");
            System.out.println("5. Exit");
            System.out.print("Enter your choice: ");
            int choice = scanner.nextInt();
            scanner.nextLine();
```

```
ProductCRUD [Java Application] C:\Users\spasd\Downloads\eclipse-jee-2022-06-R-win32-x86_64\eclipse\plugins\org.eclipse.justj.openjdk.hotspo
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 1
Enter product name: CPU
Enter price: 25000
Enter quantity: 1
Product added successfully.

Product Management System
1. Add Product
2. View Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 2
ID: 1, Name: detol, Price: 25.00, Quantity: 5
ID: 2, Name: CPU, Price: 25000.00, Quantity: 1
```

5. Learning Outcomes:

- Establish and close a database connection using JDBC.
- Execute SQL queries (INSERT, SELECT, UPDATE, DELETE) using PreparedStatement for security and efficiency.

- Implement Create, Read, Update, and Delete functionalities in Java with a MySQL database.
- Implement Create, Read, Update, and Delete functionalities in Java with a MySQL database.
- Learn to build interactive Java applications with user input handling.

Problem 3

1. **Aim:** To develop a Java application using JDBC and the Model-View-Controller (MVC) architecture to manage student records in a MySQL database.

2. **Objective:** Create a structured Java program that follows the MVC architecture, enabling users to perform CRUD (Create, Read, Update, Delete) operations on student data stored in a database.

3. **Code:**

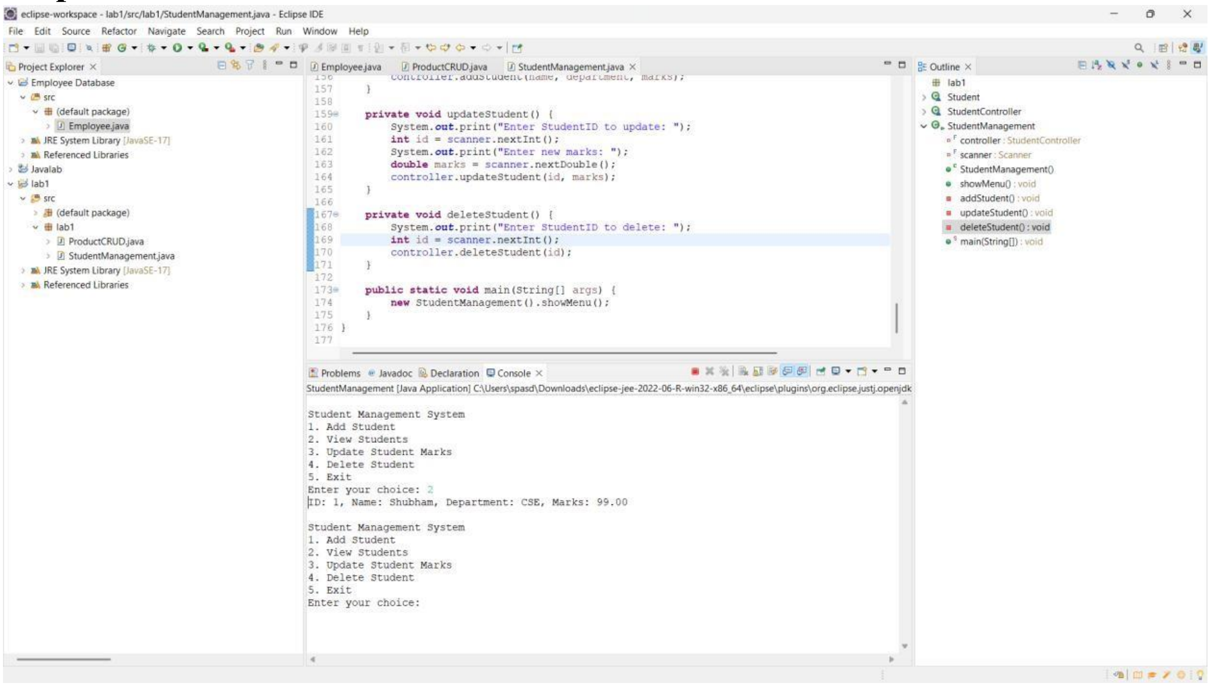
```
package lab1;


import java.sql.*; import java.util.Scanner; // Model: Student Class class Student
{    private int studentID;    private String name;    private String department;
private double marks;    public Student(int studentID, String name, String
department, double marks) {        this.studentID = studentID;        this.name =
name;        this.department = department;        this.marks = marks;
    }
    public int getStudentID() { return studentID; }
public String getName() { return name; }    public
String getDepartment() { return department; }    public
double getMarks() { return marks; }
    @Override    public String toString() {        return "ID: " + studentID + ", Name: "
+ name + ", Department: " + department + ", Marks: " + marks;
    }
}
```

```
// Controller: Handles Database Operations class
StudentController {     private static final String URL =
"jdbc:sqlite:students.db";     public StudentController() {
createTable();
    }

    private void createTable() {
        String sql = "CREATE TABLE IF NOT EXISTS Student ("
                   + "StudentID INTEGER PRIMARY KEY AUTOINCREMENT, "
                   + "Name TEXT NOT NULL, "


 + "Department TEXT NOT NULL, "
                   + "Marks REAL NOT NULL)";
 try (Connection conn = DriverManager.getConnection(URL);
Statement stmt = conn.createStatement()) {
stmt.execute(sql);        } catch (SQLException e) {
e.printStackTrace();
        }
    }
    public void addStudent(String name, String department, double marks) {
        String sql = "INSERT INTO Student (Name, Department, Marks) VALUES (?, ?,
?)";
        try (Connection conn = DriverManager.getConnection(URL);
PreparedStatement pstmt = conn.prepareStatement(sql)) {
pstmt.setString(1, name);            pstmt.setString(2, department);
pstmt.setDouble(3, marks);            pstmt.executeUpdate();
            System.out.println("Student added successfully.");
} catch (SQLException e) {            e.printStackTrace();
        }
    }
    public void viewStudents() {
        String sql = "SELECT * FROM Student";
        try (Connection conn = DriverManager.getConnection(URL);
                Statement stmt = conn.createStatement();
ResultSet rs = stmt.executeQuery(sql)) {            if
(!rs.isBeforeFirst()) {
                System.out.println("No students found.");
return;
            }
            while (rs.next()) {
                System.out.printf("ID: %d, Name: %s, Department: %s, Marks: %.2f%n",
rs.getInt("StudentID"), rs.getString("Name"),                    rs.getString("Department"),
rs.getDouble("Marks"));


    }} catch (SQLException e) {
e.printStackTrace();
        }
    }
    public void updateStudent(int studentID, double newMarks) {
        String sql = "UPDATE Student SET Marks = ? WHERE StudentID = ?";
try (Connection conn = DriverManager.getConnection(URL);
PreparedStatement pstmt = conn.prepareStatement(sql)) {
pstmt.setDouble(1, newMarks);           pstmt.setInt(2, studentID);           int
rows = pstmt.executeUpdate();
            System.out.println(rows > 0 ? "Student updated successfully." : "Student not
found.");
        } catch (SQLException e) {
e.printStackTrace();
        }
    }
    public void deleteStudent(int studentID) {
        String sql = "DELETE FROM Student WHERE StudentID = ?";
try (Connection conn = DriverManager.getConnection(URL);
PreparedStatement pstmt = conn.prepareStatement(sql)) {
pstmt.setInt(1, studentID);           int rows = pstmt.executeUpdate();
```

```
System.out.println(rows > 0 ? "Student deleted successfully." : "Student not
found.");
        } catch (SQLException e) {
e.printStackTrace();
        }
    }
}

// View: User Interface (Menu) public class
StudentManagement {     private final
StudentController controller;     private final
Scanner scanner;     public
StudentManagement() {


 controller = new StudentController();
scanner = new Scanner(System.in);
    }
    public void showMenu() {
while (true) {
            System.out.println("\nStudent Management System");
            System.out.println("1. Add Student");
            System.out.println("2. View Students");
            System.out.println("3. Update Student Marks");
            System.out.println("4. Delete Student");
            System.out.println("5. Exit");
System.out.print("Enter your choice: ");
int choice = scanner.nextInt();
scanner.nextLine();             switch (choice) {
case 1 -> addStudent();                case 2 ->
controller.viewStudents();                case 3 ->
updateStudent();                case 4 ->
deleteStudent();                case 5 -> {
```

```
System.out.println("Exiting...");
scanner.close();                    return;
                }
                default -> System.out.println("Invalid choice. Try again.");
            }
        }
    }

    private void addStudent() {
        System.out.print("Enter name: ");
        String name = scanner.nextLine();
        System.out.print("Enter department: ");
        String department = scanner.nextLine();
System.out.print("Enter marks: ");        double
marks = scanner.nextDouble();
controller.addStudent(name, department,
marks);
    }
    private void updateStudent() {
        System.out.print("Enter StudentID to update: ");
int id = scanner.nextInt();
        System.out.print("Enter new marks: ");
double marks = scanner.nextDouble();
controller.updateStudent(id, marks);
    }
    private void deleteStudent() {
        System.out.print("Enter StudentID to delete: ");
int id = scanner.nextInt();
controller.deleteStudent(id);
    }
    public static void main(String[] args) {
new StudentManagement().showMenu();
    }
```

4. Output:



```java
        controller.addStudent(name, department, marks);
    }

    private void updateStudent() {
        System.out.print("Enter StudentID to update: ");
        int id = scanner.nextInt();
        System.out.print("Enter new marks: ");
        double marks = scanner.nextDouble();
        controller.updateStudent(id, marks);
    }

    private void deleteStudent() {
        System.out.print("Enter StudentID to delete: ");
        int id = scanner.nextInt();
        controller.deleteStudent(id);
    }

    public static void main(String[] args) {
        new StudentManagement().showMenu();
    }
}
```

```
StudentManagement [Java Application] C:\Users\spasd\Downloads\eclipse-jee-2022-06-R-win32-x86_64\eclipse\plugins\org.eclipse.justj.openjdk

Student Management System
1. Add Student
2. View Students
3. Update Student Marks
4. Delete Student
5. Exit
Enter your choice: 2
ID: 1, Name: Shubham, Department: CSE, Marks: 99.00

Student Management System
1. Add Student
2. View Students
3. Update Student Marks
4. Delete Student
5. Exit
Enter your choice:
```

5. Learning Outcomes:

- Learn how to separate concerns in a Java application using Model (Student class), View (User Interface), and Controller (Database operations).
- Establish a connection with MySQL using JDBC.
- Use PreparedStatements to securely execute SQL queries.
- Implement Create, Read, Update, and Delete functions to manage student records.
- Develop an interactive user interface for managing student data.